

# An Overview on Artificial Intelligence and Its Applications

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**Abstract – Artificial intelligence (AI) has significantly altered our lives and will do so going forward. A new wave of technological innovations that can interact with the environment and imitate human intelligence is referred to as "artificial intelligence" (AI). e. This essay will discuss the fundamentals and background of artificial intelligence (AI), the ongoing research on AI, the evolution of AI, and machine learning, as well as some of the applications of AI that are being employed in a variety of sectors. This article also touches on the uses of AI in pharmaceuticals.**

**Keyword – Artificial Intelligence, Machine learning, Robotics, Pharmaceuticals.**

## HISTORY OF ARTIFICIAL INTELLIGENCE

Since the Greeks and other philosophers of the Mediterranean littoral, there have been theories about the nature of intelligence. intelligence is fundamentally related to neuronal and synaptic activity that proposed by Thorndike (1932) and Hebb (1949). It was only natural that these ideas should be applied to artificial intelligence as computing began to take off in the 1950s, as evidenced by the introduction of the Turing Test in 1950 and Strachey's first "Checkers" programme in 1952. This programme was later improved by Samuel in 1959 to the point where it could compete with the best players of the era. As older versions of the programme were compared to more recent versions, this study gave rise to the idea of an evolving programme. The term "Artificial Intelligence" was first used during a symposium held at Dartmouth College in July 1956, which is usually regarded as the beginning of the field of AI. Several people who later rose to prominence in the discipline, such as Herbert Simon, Marvin Minsky, Oliver Selfridge, Ray Solomonoff, Trenchard More, Claude Shannon, and Nathan Rochester, attended. Some of

these academics later created centres for AI study at universities including MIT, Stanford, Edinburgh, and Carnegie Mellon. For general AI, two primary approaches have been established: the "top down" approach, which began with higher level functions and implemented them, and the "bottom up" strategy, which started at the level of individual neurons and worked its way up to higher level functions. The "Logic Theorist," a software for proving theorems, was created by Allen Newell by 1956. Two main strategies have been created for general AI: the "bottom up" technique, which started at the level of individual neurons and worked its way up to higher level functions, and the "top-down" model, which started with higher level functions and implemented them. By 1956, Allen Newell had developed a programme called "Logic Theorist" for the purpose of proving theorems.[1] John McCarthy coined the phrase in 1956 to describe a branch of computer science that focuses on teaching machines to behave like people. [2] Many programmes and approaches were developed in the years that followed, including "General Problem Solution" in 1959., "Geometry Theorem Prover" in 1958, "STRIPS" in 1971, Oettinger's "Virtual Mall" in 1952, "Eliza" in 1966, "SHRDLU" in 1973, expert systems that led to Deep Blue in 1997, and some of the earliest iterations of embodied intelligence like "Herbert," "Toto," and "Genghis" by Brooks ,1987.[1] Artificial intelligence, or AI for short, is the study and development of intelligent systems. John McCarthy is credited with coining the term during the workshop at Dartmouth in 1956 where the field assumed its current form. McCarthy, incidentally, made several significant contributions to AI and Computer Science in their infancy by creating the programming language LISP and the first time-sharing operating system.[3] Artificial intelligence (AI) technologies including

machine learning (ML), natural language processing, and computer vision are progressively affecting a wide range of fields and elements of our society. AI is progressively replacing human decision-making and taking over human work. Several industries, including business, logistics, manufacturing, transportation, health care, education, and state administration, have made extensive use of it.[4]

#### WHAT IS AI?

The goal of artificial intelligence (AI), a powerful and sophisticated technology, is to mimic human intellect. The "fourth industrial revolution," defined as the transfer of agency and control from humans to technology (Schwab, 2017), is centered on AI, which fundamentally alters how we previously understood the relationships between humans and technology (Murray, Rhymer, & Sirmon, 2020). As a result of this revolution and its ramifications, organizational scholars must address new theoretical and empirical issues since AI has the potential to significantly alter both the total labour structure and how companies operate.

AI is able to learn from its interactions with the environment and modify its behaviour in response to environmental stimuli. AI's behavior is not predictable, and the intricate multi-layered process of decision-making is typically opaque due to the typically very complex and somewhat random environment in which it operates. As a result, it may be challenging to forecast the outcomes of AI judgements, and it is sometimes impossible to comprehend the reasoning behind each one.[5]

#### Classification of AI :[6]

1. Reactive machines
2. Theory of mind
3. Limited memory
4. Self-awareness

1.Reactive machines: It's the most fundamental form of AI. Reactive machines cannot remember prior experiences or data, and they also cannot utilise that information to inform judgements made now. This implies that it is solely reactive—or current—in situations.

Example: The super computer that plays chess (Deep blue)

2. Theory of mind: Theory of mind is a concept that refers to artificial intelligence, including how machines behave, think, feel, and engage in behaviours similar to those of humans. It also includes a choice creating human-like abilities

3.Limited memory : Data and limited theory are connected. It implies that knowledge was derived from previously acquired knowledge and stored data. Observational data is built upon by a limited memory with insertion of already-fixed pre-programmed data in an autonomous vehicle.

4.Self -awareness: Self-awareness involves the kind of robots that have consciousness similar to that of humans. It encompasses the capacity to identify, mimic, and think like a person about and are aware of all of its circumstances. But it's not accessible right now.

#### Machine Learning – [6,7]

Artificial intelligence is used in machine learning. It involves using the capacity to naturally learn from experience and becoming better at it.

In order to learn something, computer programs that access data are developed as the core emphasis of machine learning. Its main purpose is to make it possible for computers to automatically learn. The output is particularly efficient for managing data in large industries. Robots that manage data and do several tasks, such as a supercomputer, are one example.

It can be divided into four types –

1. Supervised machine learning
2. Unsupervised machine learning
3. Semi supervised machine learning
4. Reinforcement machine learning

#### 1. Supervised machine learning –

In this method, if the researchers instruct the computer what the right response is for a specific input. The method used to train neural networks and other machine learning architectures is the most popular. It entails figuring out how to map a collection of inputs to a target variable. The goal is a distinct, actual value. Neural networks with several layers [6] and decision trees, naïve trees, and boosting are used to solve it.

#### 2. Unsupervised machine learning –

With this approach, the learning algorithm is not provided any labels; instead, it must determine the

structure of the data on its own. It may be a goal in and of itself, such as a pattern or data that is hidden. There is still study being done, therefore researchers are unsure of what to do at this time. There is no mention of goal variables. K groups are used to solve it.

### 3. Semi-supervised machine learning –

Machine learning that is both supervised and unsupervised falls somewhere in the middle. It entails having data that are both labelled and unlabeled for training purposes. Yet, it also contains a significant amount of labelled data and a smaller amount of unlabeled data.

### 4. Reinforcement machine learning -

The computer software engages with the dynamic environment and performs specific tasks to outperform competitors. This technique enables devices and computer programmes to exhibit optimal behaviour within a predetermined range, hence enhancing performance.

## APPLICATIONS OF AI

Application of artificial intelligence in different areas such as robotics, clinical data management, dentistry, marketing, education, pharmaceutical and healthcare research, oncology and solid dosage form development.

### 1. Application of AI in Robotics –

Robotic in Pharmacy – [8]

Robotic technology is used by UCSF Medical Center to prepare and track pharmaceuticals with the aim of boosting patient safety. In their paper, they claim that the technology has effectively and with little mistake manufactured 3,50,000 doses of medicine. The robot has shown to be significantly superior to humans in terms of size and its capacity to administer precise drugs.

The manufacture of hazardous chemotherapy medications for oral and injectable use is one of the capabilities of robotic technology. This has freed up room for the UCSF nurses and pharmacists, allowing them to employ their skills by concentrating on providing direct patient care and collaborating with the doctors. It is divided into medi robots and Erica robot.

Robotic Surgery – [9]

The early use of robotic surgery was accompanied by major consequences, such as patellar tendon rupture, peroneal nerve damage, increased bleeding, and extended operation times, as is the case with any novel procedures. Infections associated with lengthy surgical procedures have significantly decreased in recent years. Robotic joint arthroplasty has been found to have better patient satisfaction, higher success rates, shorter preoperative plans and operations, more precise alignment, proper placement of components, shorter hospital stays, less bleeding, and fewer complication rates than traditional techniques.

### 2. Application of AI in Clinical Data Management – [10]

Clinical Data Management is described as the process of collecting, integrating, and validating trial data. Using software programmes that facilitate the quick identification and movement of data inconsistencies and that are used to manage audit trails, CDM has been accomplished with ease.

Software is typically needed for clinical data management to solve electronic data gathering, electronic FDA submission preparation, and clinical trial management activities that need to be speed up. Clinical trials are now more efficient, dependable, and timely thanks to cutting-edge advances in computer hardware and software, which serve as the foundation for a clinical trial's success.

### 3. Application of AI in Dentistry – [11]

Artificial intelligence (AI) has mostly been utilised in dentistry to improve diagnosis, which is crucial for attaining the greatest outcomes from treatments and providing top-notch patient care.

To assess patients and select the most appropriate course of treatment, dentists must draw on all of their expertise. Furthermore, they must make precise clinical decisions when predicting the prognosis. Dentists occasionally lack the expertise necessary to make the best clinical choice in a short amount of time, though. They may use AI apps as a guide to help them make better decisions and perform better.

### 4. Application of AI in Marketing – [12]

Artificial intelligence-driven chatbots using Natural Language Processing enhance customer experience (NLP). AI and ML algorithms made it possible to process data effectively, which helped us come up with

the best conclusion. AI must be used to assess client buying patterns, purchasing patterns, preferences, and other data. Artificial Intelligence User Interface (AIUI) functionalities have helped Customer Relationship Management (CRM) processes (AIUI). Traditional retail stores were transformed into smart retail stores by AI and IoT.

The improved supply chain and improved customer experience are attributes of smart retail establishments.

#### 5. Application of AI in Education – [13]

Researchers have significantly advanced AI in education during the previous ten years. In this area, we examined the research trends of our relevant themes throughout the previous ten years. Figure 1 displays the research article in progressively greater numbers. This information was acquired by a search using the phrases "AI" and "Education" in the Google Scholar and Web of Science research databases. Forecasts indicate that the research published on the aforementioned issues increased sharply from 60 to 90 between 2010 and 2015. From 2016, it began to rise steadily, reaching 190 research articles in 2019. The results demonstrate a rising tendency in that field of research.

#### 6. Application of AI in Pharmaceutical and Healthcare Research – [14]

Disease analysis becomes essential for developing a thoughtful treatment plan and ensuring patients' wellbeing. Accurate diagnosis is hampered by human error, and misunderstanding of the generated information makes the work difficult and time-consuming. By ensuring accuracy and efficiency, AI may be applied in many different ways. After a thorough review of the literature, applications of various technologies and approaches for illness diagnosis have been documented. According to many environmental expressions, as the human population grows, there is a constant rise in the need for the healthcare system.

#### 7. Application of AI in Oncology – [15]

Prognostic data can also be gleaned from medical imaging. Radiomics can be used in cancer to evaluate and forecast clinically important factors. Theoretically, radiomics may be easily incorporated in cancer care due to imaging being regularly used for

patient follow-up and cancer diagnosis. It's possible to employ other sorts of information, such genetic data, for prognostic reasons. Prognostic factors that may be accessible using AI algorithms include risk-stratification, treatment complications, survival, and therapeutic response. Nonetheless, there is still a long way to go, and success also depends on the stakeholders' education.

#### 8. Application of AI in Solid Dosage form development – [16]

In recent years, a number of AI-based models have been effectively used in the creation of pharmacological solid dosage forms. A mix of computer science, data analytics, and mathematics is used to create artificial intelligence. ML may often be divided into supervised learning, unsupervised learning, and reinforcement learning as an area of AI. An method known as supervised learning uses output/target variables that will be predicted from a collection of input variables. Throughout the training phase, a function of the input vs. intended output will be produced, resulting in the desired degree of accuracy. The development of solid dose formulations has made substantial use of a number of supervised learning methods, including support vector machines, decision trees, logistic regression, XGBoost, and K-Nearest Neighbors (KNN).

A feature-finding and grouping approach known as unsupervised learning solely controls the input variables. In order for the model to teach itself to perform at its best, reinforcement learning is largely driven by particular decisions in a certain environment where the computer will receive either rewards or penalties for the actions it does.

### CONCLUSION

The study of artificial intelligence has given robots the capacity to think conceptually and analytically. The artificial intelligence techniques from the past 20 years have made a significant contribution to several fields. Artificial intelligence will keep taking on more and more significance across a range of industries. The idea of artificial intelligence serves as the foundation for this paper. This paper is based on the concept of artificial intelligence, area covered by AI, machine learning and various application of artificial intelligence in pharmaceuticals.

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