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## A Detailed Review On Artificial Intelligence In Pharmacy

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### ABSTRACT

Artificial intelligence (AI) focuses on creating intelligent models that help us envision knowledge, solve problems, and make decisions. AI is active these days, it plays an important role in various areas of pharmaceutical science, such as drug development and formulation of drug administration. For drug discovery and drug discovery research, such as development, poly-pharmacology, and hospital pharmacy, development of various artificial neural networks (ANNs) such as delivery formulations and Deep Neural networks (DNN) or recurrent neural networks (RNN) are used. Artificial intelligence (AI) focuses on creating intelligent models that help us envision knowledge, solve problems, and make decisions. AI is active these days, it plays an important role in various areas of pharmaceutical science, such as drug development and formulation of drug administration. For drug discovery and drug discovery research, such as development, poly-pharmacology, and hospital pharmacy. Development of various artificial neural networks (ANNs) such as delivery formulations and Deep Neural networks (DNN) or recurrent neural networks (RNN) are used.

**Keywords:** Artificial Intelligence, Drug Discovery, Drug delivery research, Hospital pharmacy.

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## INTRODUCTION

Artificial Intelligence (AI) is a branch of computer science related to intelligent machines that use symbolic programming to solve problems. It has been deeply involved in the science of problem solving through the application of workplace health care and pharmaceutical engineering <sup>1</sup>. Artificial intelligence has results similar to human attentional processes <sup>2</sup>. This process generally involves developing efficient systems that use training data or apply acquired data, demonstrating explicit or approximate fusion, and self-correction / adaptation <sup>3</sup>.

The main purpose of this artificial intelligence in pharmacy is to analyze effective data processing problems and abstractly express solutions to these issues. This kind of computation is called a method and corresponds to a theorem in mathematics <sup>4</sup>. Artificial intelligence is used to analyze machine learning that mimics individual cognitive tasks <sup>5</sup>.

Artificial intelligence technology is used to execute more detailed analysis and provide useful interpretations. This perspective combines a variety of useful static models and computational intelligence in artificial technology. AI is a thriving technology that is being applied to many areas of life and industry. Recently, pharmaceutical industry has discovered new and inventive ways to use this powerful technology to solve some of the biggest problems facing the pharmaceutical industry Today. Artificial intelligence in the pharmaceutical industry is the use of automated algorithms to perform tasks that traditionally depended on human intelligence. Over the past five years, the use of artificial intelligence in the pharmaceutical and biotech industries has redefined how scientists develop new drugs and fight disease <sup>6</sup>.

The use of artificial intelligence models also enables prediction of *in vivo* responses, pharmacokinetic parameters of therapeutic agents, appropriate dosages, and more. Consistent with the importance of drug pharmacokinetic prediction, the use of *in silico* models facilitates drug efficacy and cost-effectiveness. drug research. There are two main classes of artificial intelligence development. The first is traditional computer methods involving expert systems that can inspire humans as well as expert systems and show conclusions that can be drawn from principles. The second involves systems that can model how the brain works by implying an artificial neural network <sup>7</sup>.

The term AI (also known as machine intelligence) is often confused with robotics and automation and is used interchangeably. Robotics simply refers to creating machines that can perform difficult and repetitive tasks, whereas AI refers to displaying human-like behavior and intelligence through computers or machines <sup>8</sup>. Traditionally, robots were not built with this "intelligent ability," but in a process known as automation, they use developed programs and surface sensors to move and carry

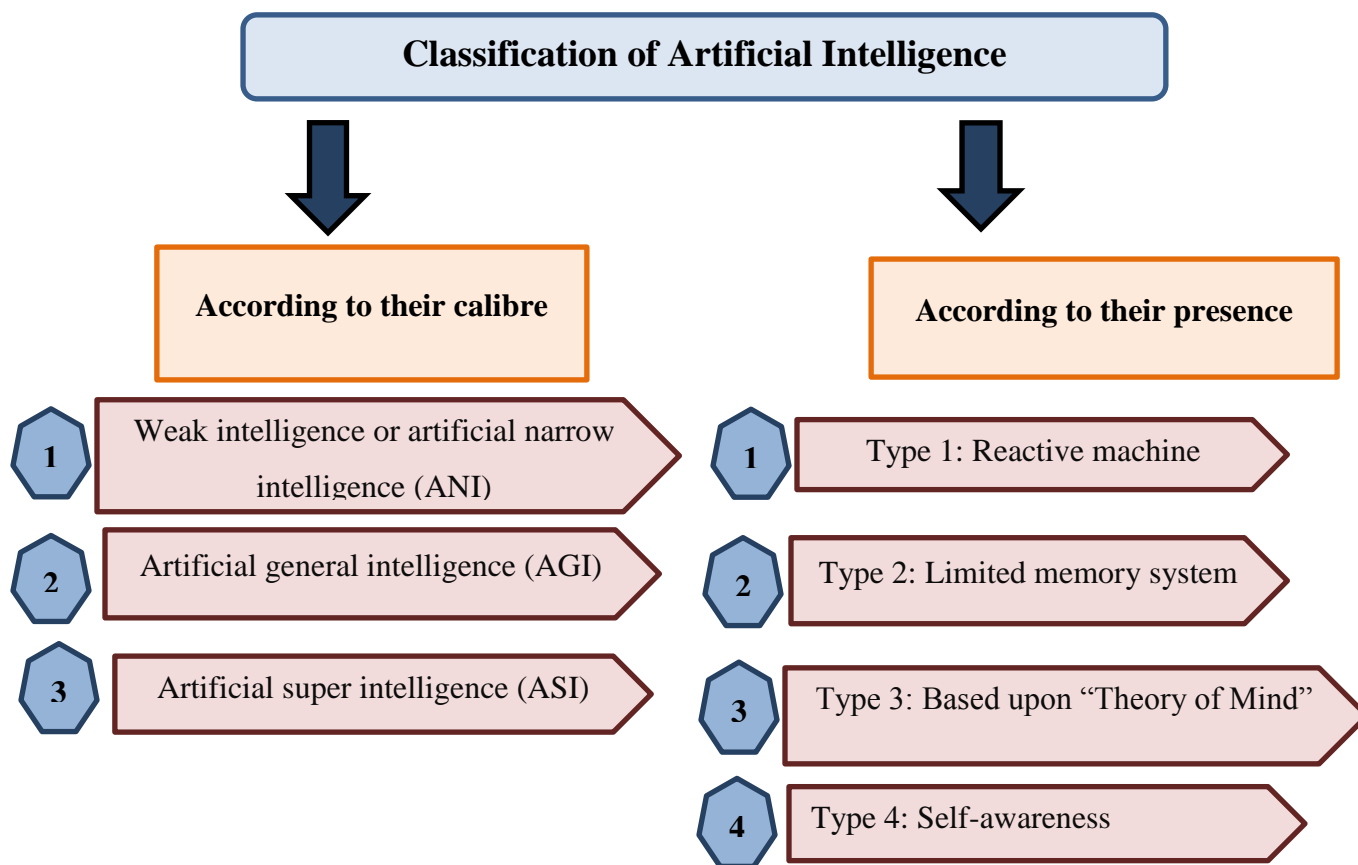
objects independently. You may be able to AI is essentially a branch of computer science dedicated to creating intelligent machines capable of performing tasks normally performed by humans<sup>9</sup>.

### **History of artificial intelligence:**

The origins of artificial intelligence (AI) may be traced back to myths, legends, and rumours of man-made creatures that were given intellect and consciousness by skilled artisans. Philosophers who attempted to characterize human mind as the mechanical manipulation of symbols provided the groundwork for contemporary AI. In the 1940s, this study led to the creation of the programmable digital computer. This device is an abstract representation of mathematical thinking. Several scientists have been motivated by this gadget and the concepts underlying it to carefully consider the viability of creating an electronic brain. In a workshop held on the campus of Dartmouth College in the United States in the summer of 1956, the area of artificial intelligence research was founded<sup>10</sup>.

For decades to come, participants will be the top minds in AI research. Many of them were given millions of dollars to realize their goal of creating computers that were as clever as humans within only one generation<sup>11</sup>.

According to reports, the natural language processing industry, which encompasses a variety of appliances including text prediction, voice, and speech recognition, grew by 28.5% in 2017. Big data and business analytics generated \$122 billion in global revenue in 2015, and it is predicted that this figure will surpass \$200 billion by 2020. The 1950s are when artificial intelligence first emerged. He was formerly seen of as a field for daydreamers, but that started to change in 1997 after IBM's Deep Blue computer defeated world chess champion Garry Kasparov. 2011 saw the \$1 million prize won by IBM's new supercomputer Watson on the US quiz programme Jeopardy. Since then, Watson has increased its involvement in healthcare and medication research, including a 2016 cooperation with Pfizer to quicken immuno-oncology drug discovery. In December 2016, IBM partnered with Pfizer to launch IBM Watson, a cloud-based medical laboratory reporting tool that enables researchers to identify relationships between different datasets through dynamic visualizations<sup>12</sup>.

**CLASSIFICATION OF ARTIFICIAL INTELLIGENCE: 13,14****Figure 1: Classification of Artificial Intelligence**

On the basis of their calibre, Artificial Intelligence system is classified as follows:

**1. Weak intelligence or Artificial narrow intelligence (ANI):**

The system is intended and experienced to execute narrow tasks such as facial recognition, driving a car, chess, and traffic lights. for example. Apple SIRI virtual personal assistant, social media tagging.

**2. Artificial General Intelligence (AGI) or Strong AI:**

Also called human-level AI. It can simplify people's intellectual abilities. This will help you find solutions when faced with unknown tasks. Being human, her AGI can do anything.

**3. Artificial Super Intelligence (ASI):**

It is a brain power that is more active than intelligent people in fields such as drawing, mathematics, and space. In every field from science to art. They range from a computer slightly more intelligent than a human to a computer a trillion times more intelligent than a human.

AI scholar Arend Hinze <sup>18</sup> categorized AI technologies based on their existence and non-existence. they are as follows:

**Type 1:** This form of AI system is termed a reactive machine. For example, Deep Blue, his IBM chess program that brought world chess champion Garry Kasparov to market in the 1990s. You can determine and predict queens on the chessboard. I have no memory of making use of my past experiences. It is designed for use in tight spaces and is useless in other situations. Another example is Google's AlphaGo.

**Type 2:** This category of AI system is termed as memory-limited system. The system can apply past experience to current and future problems. In self-driving cars, some decision functions are directed only this way. Recorded observations are used to record future actions, such as a car changing lanes. Observations are not permanently stored.

**Type 3:** This kind of AI system is called "theory of mind". This means that every person has their own thoughts, intentions, and desires that influence their decision-making. This is non-existent AI.

**Type 4:** These are termed as self-awareness. AI systems have a sense and perception of themselves. Once a machine is self-aware, it understands its state and uses the ideas in other people's brains. This is an AI system that doesn't exist.

### **ADVANTAGES OF AI <sup>15-17</sup>**

#### **Error Minimization:**

It helps reduce errors and increase accuracy, allowing robots to explore space.

#### **Difficult Exploration:**

This system is useful in mining, fuel exploration, and ocean exploration.

#### **Daily Application:**

AI is useful for everyday tasks, such as GPS and Androids, to predict and correct spelling mistakes.

#### **Limitless Functions:**

Machines are not restricted to any boundaries. The emotionless machines can do everything more efficiently and, also produce more accurately than the human beings.

#### **Digital Assistants:**

AI systems like 'avatar' are being used to reduce human needs, as they are emotionless and can make logical decisions without human emotions.

#### **Repetitive Tasks:**

Humans can only perform one task at a time, while machines can multi-task and analyze faster than humans. Machine parameters, such as speed and time, can be adjusted to meet their needs.

**Medical Uses:**

AI programs enable physicians and trainee surgeons to assess patient conditions and analyze adverse effects and health risks associated with medication, such as artificial surgery simulators.

**No Breaks:**

Machines are programmed to work continuously for long hours without confusion or boredom, unlike humans who can only work 8 hours/day.

**Increase technological growth rate:**

Machine learning programs can be repaired if a mishap occurs in a risky zone, reducing the risk of harm to personnel.

**No Risk:**

Machine learning programs can be repaired if a mishap occurs, reducing the risk of harm to personnel engaged in risky zones.

**As an aid:**

AI technology can serve both children and elders 24/7, providing teaching and learning resources for all.

**DISADVANTAGES OF AI**<sup>15-17</sup>**No replicating humans:**

Robots with AI technology have the power to think like humans and be emotionless, allowing them to perform tasks more accurately without judgment. No improvement with experience AI technology cannot be used to improve human resources, as it cannot identify hardworking and nonworking individuals.

**No original creativity:**

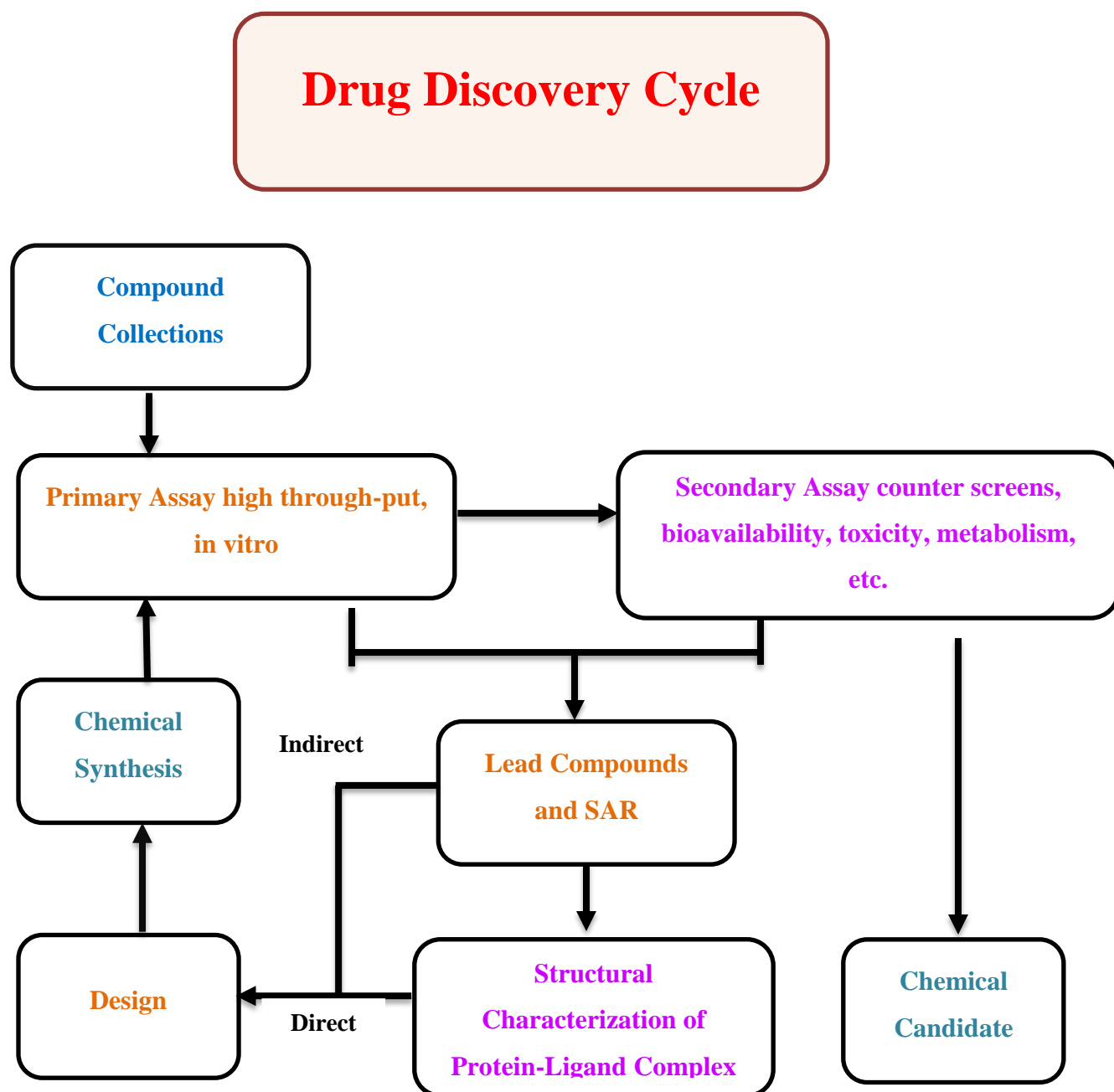
Humans have the ability to use their creativity and thoughts, which are not achievable by AI technology.

**Unemployment:**

This technology can lead to large-scale unemployment, affecting human workers' working habits and creativity.

**Expensive:**

AI machines require complex designing, maintenance and repairing, which requires a long period of time from the R&D division. Regular software updates and reinstallations and recovery of the machine also consume time and money.

Artificial Intelligence in Drug Discovery: <sup>18</sup>**Figure 2: Drug Discovery Cycle**

AI technologies in the healthcare industry have enabled pharmaceutical companies to expedite their drug discovery process. Moreover, it automates target identification and facilitates medication repurposing by evaluating off-target chemicals. This results in quicker drug development and reduced repetitive tasks in both the AI and healthcare sectors.

Leading biopharmaceutical firms are developing numerous treatments, such as Pfizer's employment of IBM Watson, a machine learning-based system, to explore immuno-oncology therapies. IBM Watson is especially useful for image and signal processing, as well as predicting

changes in function, like bladder control, epileptic seizures, and strokes. AI has a third advantage for healthcare, which is public health and epidemiology. It can detect infectious epidemics of various diseases, such as influenza, dengue fever, TB, and malaria. Artificial intelligence has also predicted the transmission patterns of the Zika virus and the current COVID-19 pandemic.

#### **AI in clinical practice:**

AI plays a vital role in healthcare industry by performing important tasks such as data collection, storage, normalization, and data tracing. Through extensive analysis of vast genetic data and medical records, deep genomics can detect mutations and links to diseases by recognizing patterns. Novel computational techniques are being created to demonstrate to medical professionals the effects of genetic variation, whether it is natural or therapeutic, on DNA within a cell.

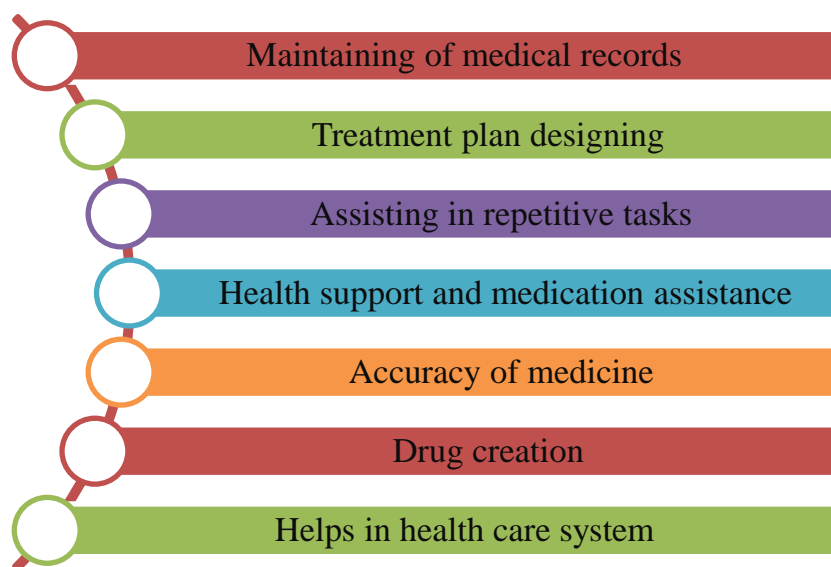
#### **AI in diagnosis and targeted genomic treatments:**

Artificial intelligence (AI) is utilized in healthcare facilities in numerous ways, such as organizing medication types for individual patients and selecting suitable or accessible methods of administration or treatment regimens.

#### **In accuracy of medicine:**

The impact of artificial intelligence on genetic evolution and genomics is beneficial. The Advanced Genomics AI platform is efficient in detecting genomic data and medical records patterns that indicate mutations and correlations that cause diseases. This approach equips healthcare professionals with insights into the cellular changes that occur when genetic variations alter DNA <sup>19</sup>.

#### **APPLICATIONS OF ARTIFICIAL INTELLIGENCE:<sup>20-26</sup>**



**Figure 3: Applications of Artificial Intelligence**



**Maintaining of medical records**

The Google Deep Mind health project (developed by Google) enables the collection, storage, normalizing, and tracing of medical records in a short period.<sup>1</sup> This project is useful for better and faster health care, and the Moor Fields Eye hospital NHS is aided by it for improving eye treatment.<sup>17</sup>

**Treatment plan designing**

AI technology is used to design effective treatment plans for patients with critical conditions. IBM Watson for Oncology is a cognitive computing decision support system that analyses patient data against thousands of historical records to help oncology clinicians make informed decisions.<sup>17</sup>

**Assisting in repetitive tasks**

AI technology can be used to detect and identify diseases or disorders, such as X-ray imaging, radiology, ECHO, ECG. Medical Sieve is a cognitive assistant with analytical and reasoning abilities. Deep learning can be used for almost all types of imaging analyses, such as X-ray, CT scan, ECHO, ECG.<sup>18</sup>

**Health support and medication assistance**

Molly, a virtual nurse, and Ai Cure are two apps that help patients with severe medication situations and clinical trials. Molly provides a pleasant voice and face, while Ai Cure monitors patients and assists them to control their conditions.<sup>19</sup>

**Accuracy of medicine**

AI technology has a positive impact on genomics and genetic development, such as Deep Genomics, which identifies mutations and linkages to diseases. Craig Venter's algorithm, "Human Longevity", provides information on patients' physical characteristics based on their DNA.<sup>19,20</sup>

**Drug creation:**

AI technology uses supercomputers to identify safe and effective therapies for the Ebola virus and big data to find the reasons why some patients survive diseases. It helps in the discovery and design of drugs, healthcare, and problem-solving applications.<sup>21</sup>

**Helps in health care system:**

Open AI ecosystems are used to collect and compare data from social awareness algorithms to analyze patient medical history and treatment data, providing suggestions about lifestyle and habits.<sup>22</sup>

**Healthcare system analysis:**

Zorgprisma Publiek, a local company, uses IBM Watson cloud technology to analyze invoices, allowing for easy retrieval of treatment data, physician names, and hospital names. This helps to avoid patient hospitalization and improves patient care.<sup>23</sup>

### **Challenges of Introducing AI into Pharmaceuticals:** <sup>12</sup>

AI has ample potential to redefine the pharmaceutical industry, but implementation itself is not trivial. Challenges in Pharmaceutical Companies face, when adopting AI:

#### **Unfamiliarity with technology:**

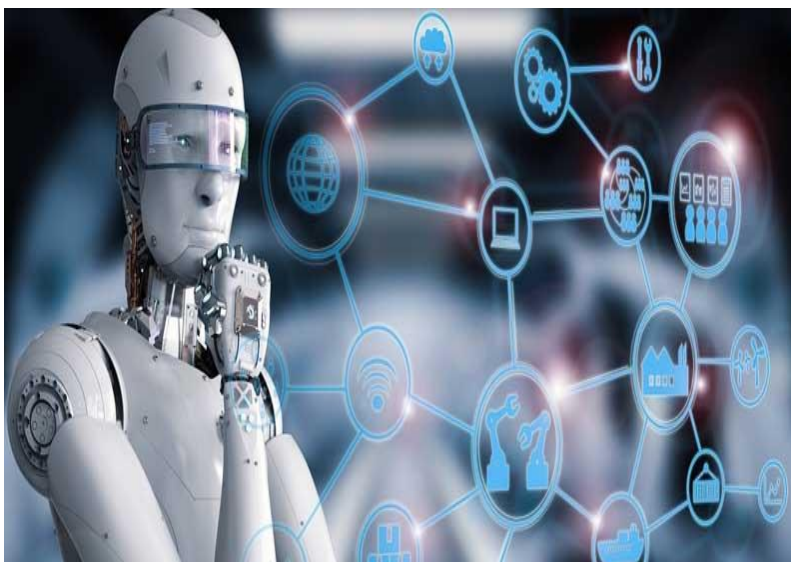
AI still seems to be a problem for many pharma companies because of its novelty and difficulty; it is called a "black box."

#### **Need of appropriate IT framework:**

This is because most IT applications and infrastructure in use today were not refined or designed with artificial intelligence in mind. To make matters worse, pharmaceutical companies have to spend a lot of money to modernize their IT systems.

#### **Much of the information is in a free content organize:**

Which means pharma companies got to go over and past to collate and put this information into a frame that's able to be analyzed. In spite of all these confinements, one thing is for certain. AI is as of now rethinking biotech and pharma. And a long time from presently, Pharma will basically see at manufactured insights as an essential, regular, innovation.



**Figure 4: Challenges to adoption of AI in Pharma**

### **CONCLUSION:**

In recent years, AI technical approaches believe in the same way humans imagine knowledge, so AI technology has been applied to the analysis and interpretation of key areas of pharmacy such as drug development, dosage form development, polypharmacology, and hospital pharmacy. There

has been a significant increase in interest in using, solve problems and make decisions. Using automated workflows and databases for effective AI-powered analytics, the approach has proven useful. By utilizing the AI approach, it becomes possible to design new hypotheses and strategies, as well as various predictions and analyses. Related elements can be easily implemented in less time and at a lower cost.

**Conflict of Interest:**

The authors have no conflict of interest.

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