

An Overview on Applications of Artificial Intelligence in Pharmacy

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Abstract: Artificial intelligence (AI) can give intelligent ideas for disease diagnosis and therapy by evaluating physiological data from wearable technology. AI and robots are getting more acceptable for doctors, and a growing number of institutions are using robots along with human supervision to do tasks that were previously performed by humans. The main advantage of AI is that it decreases the time required for medication development, which reduces the expenses associated with drug research, improves the returns on investment, and may even result in a cost reduction for the end user. The tools like MEDi robot and robotic pharmacy are described in this review. Personal health or pathology records and public health organizations could benefit from AI analysis to speed up and minimize failures in the drug discovery process. The different AI tools like robotic pharmacy used in the production of oral and injectable medications, including hazardous chemotherapy agents. Many studies are being conducted to improve the already existing AI technologies in order to make the pharmaceutical profession more efficient. The purpose of this article is to provide a quick overview of the importance of AI in pharmacy.

Keywords: Artificial intelligence, MEDi Robot, Robotic pharmacy, drug discovery.

I. INTRODUCTION

The field of artificial intelligence (AI) explores intelligent machine learning, primarily through intelligent computer programs that produce outcomes equal to those of human attention.[1] Artificial intelligence (AI) can be utilized to analyze machine learning and mimic human cognitive tasks. AI technology is used to obtain better interpretation and to conduct studies that are more accurate than human [7]. Obtaining data, establishing effective methods for using collected data, showing final or approximate findings, and self-corrections/adjustments are all part of this AI process [2]. The growth and invention of AI applications are frequently linked to the worry of job loss. However, practically all developments in the applications of AI technology are being hailed because of the confidence, which greatly contributes to the industry's progress [3]. The excitement around AI technology in pharmacy has already given way to optimism, particularly in the fields of drug discovery, drug delivery formulation development, and other healthcare applications. Utilizing AI models also makes it feasible to predict in vivo reactions, therapeutic pharmacokinetic parameters, appropriate dosage, and other factors [4]. Given the importance of pharmacokinetic prediction, the use of in silico models in drug research contributes to its low costs and efficacy. The new AI pharmacy system automates repetitive operations, offers individualized treatment plans, lowers costs, and improves patient outcomes while replacing the old manual procedures and human decision-making of the previous pharmacy system [5]. But it's essential to make sure AI is applied correctly and carefully, and that its effects on society and the workforce are properly taken into consideration. Drug discovery applications can benefit from the use of AI techniques like graph neural networks, generated models and structure-based approaches like molecular docking and molecular dynamics simulations [6].

History of artificial intelligence:

The genesis of artificial intelligence (AI) may be found in stories, myths, and mythology about created beings given with intelligence and consciousness by talented artisans. Modern AI developed with philosophers who tried to describe

the human mind as a machine that manipulates ideas [8]. This research resulted in the development of the programmable digital computer in the 1940s. This tool is a visual illustration of how mathematics works. This device and the ideas behind it have inspired a number of scientists to carefully assess the feasibility of developing an electronic brain. The field of artificial intelligence study was established in a workshop conducted in the summer of 1956 on the campus of Dartmouth College in the United States [9]. Participants will be the brightest minds in AI research for years to come. Millions of dollars were granted to several of them in order to fulfill their ambition of building computers within a single generation that were as intelligent more than people. The natural language processing sector, which includes voice, speech, and text prediction among other applications, is said to have increased by 28.5% in 2017. Global revenue from big data and business analytics reached \$122 billion in 2015, and by 2020, it is expected to rise to over \$200 billion. Artificial intelligence started to develop in the 1950s. Before IBM's Deep Blue computer beat world chess champion Garry Kasparov in 1997, people's perception of him as a sport for dreamers began to shift. On the American game show Jeopardy, IBM's powerful supercomputer Watson took home the \$1 million prize in 2011. Since then, Watson has stepped up its efforts in the fields of medicine and healthcare research. In 2016, it partnered with Pfizer to expedite the discovery of drugs for immune-oncology. With the help of Pfizer, IBM and the company launched IBM Watson in December 2016. This cloud-based medical laboratory reporting tool allows researchers to use dynamic visualizations to find connections across various datasets [10].

Artificial intelligence (AI) in medicine:

Artificial intelligence (AI) enable computers and robots that mimic human intellectual behavior develop medicine formulations, support robotic surgery and clinical diagnostics, create medical statistical datasets, and understand the cellular architecture of human illnesses like cancer [11]. AI has the ability to revolutionize medical practice and improve safety, accuracy, and speed. To assess the therapeutic impact of artificial intelligence in medical radiography, huge databases have been developed and are updated on a daily basis.

II. MEDICATION MANAGEMENT

Medication management is one of the most major ways AI could change pharmacy practice. Artificial intelligence may help pharmacists manage their medicine inventory, estimate medication demand, and identify potential drug interactions and bad reactions. This can assist pharmacists in making better educated judgments about prescription drugs and medication regimen management. AI can also assist pharmacists in monitoring their patients' drug adherence [12]. AI can help pharmacists identify patients at risk of non-adherence by assessing patient data such as prescription consumption and refill history. Pharmacists can then act before medication-related side effects arise. [13] AI has the capability to boost pharmacists' participation with their patients because to its capacity to regularly track patient adherence.

Applications of Artificial Intelligence technology:

Error Minimization: Artificial Intelligence (AI) lowers human error and raises the possibility of having greater accuracy. Because of their metal bodies, resistance, and increased capacity for handling the harsh atmosphere of space, intelligent robots are a good choice for space exploration [14].

Digital Assistants: To minimize the need for human personnel, advanced companies install artificial intelligence (AI) systems that "avatar," or mimic, digital assistants [7]. Since the avatars lack emotion, they reason logically and make the proper decisions. Generally speaking, human emotions are linked to moods, which impair judgment and reduce productivity. Machine intelligence did not detect this issue.

Applications in Medicine: With the aid of AI, doctors are now evaluating patients and analyzing health issues. The doctors are learning about different medications and their negative effects via the AI algorithm. With the aid of artificial surgical simulations, training surgeons are learning new skills [15]. Artificial surgical simulators, such as those that simulate the heart, brain, or gastrointestinal tract, are used to teach them.

Serve as aids : AI-enabled machines can provide 24/7 support to older individuals or kids with disabilities. They serve as a resource for education. They are also helpful in providing security alerts during bank robberies, fires, and harsh weather.

Difficult Exploration: This technique is applicable to the mining and fuel exploration businesses. Artificial intelligence (AI) technologies may be useful for exploring the ocean to get beyond human limits. Robots may be programmed to carry out more demanding and difficult assignments with ease and without becoming exhausted.[20]

Artificial Intelligence in Surgery: Research on novel AI-based applications and current advancements in surgery is quite exciting. For decades, clinical machine interaction has been needed to help oncologists. While previously high-risk patient tissue samples were only proven to be benign after surgery, it has been discovered that AI aid adds significantly by lowering the occurrence of 30.6% breast conserving surgery (mastectomy).[19]

III. TOOLS OF AI

Many artificial intelligence (AI) tools have been developed to address the needs of the pharmaceutical sector. These instruments have produced positive outcomes. The following is a description of some of the AI technologies that have become quite popular in the pharmaceutical industry:

A) Roboticpharmacy:

UCSF Medical Center employs robotic technology for drug preparation and tracking in an effort to increase patient safety. They claim that the system has successfully prepared 350,000 doses of medicine. The robot has shown itself to be far superior to humans in terms of both appearance and medicine delivery accuracy [22]. The production of oral and injectable medications, including hazardous chemotherapy agents, is one of the capabilities of robotic technology. This has allowed the UCSF nurses and pharmacists to focus on direct patient care and collaborate with the doctors, making better use of their knowledge. UCSF pharmacists and doctors electronically submit medicine orders to the pharmacy's automated system's computers. The robots then choose, package, and dispense specific amounts of the medicines. After that, the dosages are assembled by machines into a plastic ring with a barcode [23]. This pharmacy tool are majorly used in future field. Every medication that a patient has to take within 12 hours is included in the thin plastic ring. What makes the automated system even more powerful is its capacity to fill intravascular syringes with the appropriate drug and to make sterile preparations intended for chemotherapy.

B) MEDi robot:

MEDi is an abbreviation for Medicine and Engineering Designing Intelligence [25]. Tanya Beran, professor of Community Health Sciences at the University of Calgary in Alberta, oversaw the initiative that resulted in the creation of the pain management robot. She had the idea after working in hospitals where children screamed during medical procedures. The robot initially establishes a relationship with the youngsters before informing them of what to expect during a medical treatment. It instructs them on what to do, how to breathe during the operation, and how to deal with the medical treatment. Although the robot cannot think, plan, or reason, it may be designed to exhibit AI. Aldebaran Robotics' MEDi, which has inbuilt face recognition technology, can speak 20 different languages and is very adaptive to varied settings [27]. The retail price of the robot is \$9000; but, when the apps required for the robot to assist in medical operations are installed, the price climbs to \$15000-\$30000. The robot was first designed for pain treatment, but its applications have now evolved to include comfort between surgeries, physical therapy, and marketing [29].

IV. CONCLUSION

AI is changing the way pharmacists provide services, from enhancing patient safety and treatment outcomes to optimizing procedures and providing individualized care. AI is altering the way pharmacists perform their services, from improving patient safety and treatment outcomes to optimizing operations and providing personalized care. The tools of AI like Medi robot and robotic pharmacy are used in pharmaceutical sectors. The major application of AI is Error Minimization in drug preparation and prescription as well as drug distribution and increases the accuracy of work in pharmaceutical field.

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CONFLICT OF INTEREST

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