

Role of Artificial Intelligence in the Pharmaceutical Industry

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ABSTRACT

“Artificial intelligence” is the theory and development of computer systems to perform tasks that would require human cognition, such as ability to understand, language understanding, reasoning, learning, planning, and problem-solving. Following the fundamental theorem of informatics, a better term for AI would be “augmented intelligence,” or increasing the strengths of computers and the strengths of clinicians together to obtain improved outcomes for patients. The use of artificial intelligence has proven to be useful in the field of medicine by improving positive outcomes and reducing unnecessary expenses and also saving a lot of time. The aim of this article is to enlighten people about the uses of artificial intelligence in the pharmacy field.

Key words: Artificial intelligence, human cognition, augmented intelligence

1) INTRODUCTION:

Artificial intelligence (AI) is a branch of computer science that deals with problem-solving with the help of symbolic programming. It has greatly evolved into a science of problem-solving with huge applications in business, health care, and engineering [1]. The main objective of this artificial intelligence is to identify useful information processing problems and give an idea of how to solve them. In Recent times the pharmaceutical industry discovers novel and innovative ways to use this powerful technology to help solve some of the biggest problems facing pharma today. Artificial intelligence in Pharma refers to the use of automated algorithms to perform tasks that traditionally rely on human intelligence. Over the last five years, the use of artificial intelligence in the pharma and biotech industry has redefined how scientists develop new drugs, tackle the disease, and more.

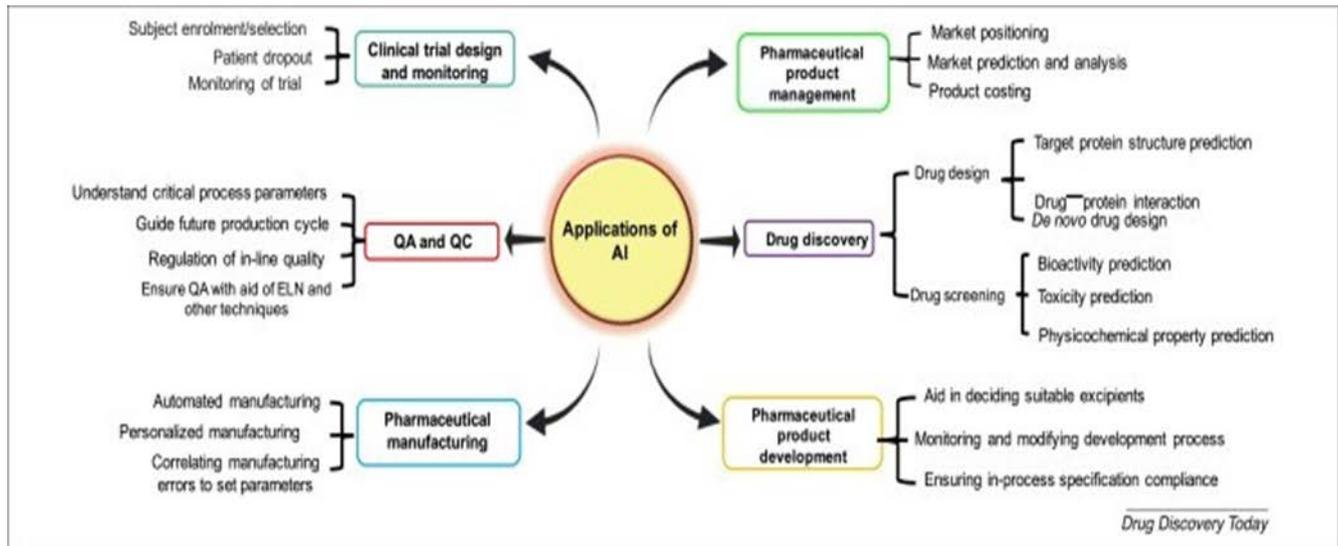
Drug discovery takes a long time to test compounds against samples of diseased cells. Finding compounds that are biologically active and are worth investigating further requires even more analysis. To speed up this screening process, many companies started using artificial intelligence for better outcomes. As computers are far quicker compared to traditional human analysis and laboratory experiments in uncovering new data sets, new and effective drugs can be made available sooner. The current AI applications by the top biopharmaceutical companies include:

[a] mobile platform to improve health outcomes –the ability to recommend patients by means of real time data collection and thus improve patient outcomes.

[b] drug discovery- pharma companies in conjunction with software companies are trying to implement the most cutting –edge technologies in the costly and extensive process of drug discovery.

However, this digitalization comes with the challenge of acquiring, scrutinizing, and applying that knowledge to solve complex clinical problems. This motivates the use of AI, because it can handle large volumes of data with enhanced

automation. AI is a technology-based system involving various advanced tools and networks that can mimic human intelligence. At the same time, it does not threaten to replace human physical presence completely



Before AI systems can be deployed in healthcare applications, they need to be ‘trained’ through data that are generated from clinical activities, such as screening, diagnosis, treatment assignment, and so on, so that they can learn similar groups of subjects, associations between subject features and outcomes of interest. These clinical data often exist in but are not limited to the form of demographics, medical notes, electronic recordings from medical devices, physical examinations, and clinical laboratory images.

AI devices mainly fall into two major categories. The first category includes machine learning (ML) techniques that analyze structured data such as imaging, genetics, and EP data. In medical applications, the ML procedures attempt to cluster patients’ traits or infer the probability of the disease outcomes. The second category includes natural language processing (NLP) methods that extract information from unstructured data such as clinical notes/medical journals to supplement and enrich structured medical data. The NLP procedures target turning texts into machine-readable structured data, which can then be analyzed by ML techniques.

2) HISTORY OF AI:

Artificial intelligence has a history back to the 1950’s. The first AI program was designed by Newell and Simon in 1955. John McCarthy coined the term artificial intelligence and is regarded as the father of AI. There were several limitations in early models that prevented widespread acceptance and application to medicine. In the early 2000s, many of these limitations were overcome by the advent of deep learning. By 2011, IBM’s new Watson supercomputer was able to win the US\$1m prize in the US game-show Jeopardy. Since then, Watson has expanded into healthcare and drug discovery, including a partnership with Pfizer in 2016 to accelerate drug discovery in immuno-oncology.

3) AI IN CURRENT SCENARIO:

The McKinsey Global Institute estimates that AI and machine learning in the pharmaceutical industry could bring a revenue of nearly \$100B yearly across the US healthcare system. Top pharmaceutical companies, including Roche, Pfizer, Merck, AstraZeneca, GSK, Sanofi, AbbVie, Bristol-Myers Squibb, and Johnson & Johnson have already collaborated with or acquired AI technologies.

In 2018, the Massachusetts Institute of Technology (MIT) partnered with Novartis and Pfizer to transform the process of drug design and manufacturing with its machine learning for pharmaceutical drug discovery and synthesis. In late 2018, Bayer announced an artificial intelligence collaboration with cyclica to take its discovery of peptide drugs to next level. GSK also entered into a collaboration with Cloud Pharmaceuticals to accelerate the discovery of novel drug candidates. And in

April 2020, GSK and Vir Biotechnology partnered to enhance COVID-19 drug discovery through CRISPR and AI.

4) TOOLS OF AI IN PHARMACY FIELD:

Robot pharmacy:

UCSF Medical Center uses robotic technology for the preparation and tracking of medications. According to them, the technology has prepared 3, 50, 000 medication doses without any error. The robot has proved to be far better than humans both in size as well as its ability to deliver.

The abilities of the robotic technology include preparation of oral as well as injectable medicines which include chemotherapy drugs that are toxic. This has given freedom to the pharmacists and nurses of UCSF so that they can utilize their expertise by focusing on direct patient care and working with the physicians.



TUG robots:

Aethon TUG robots are designed to travel through the hospital and deliver drugs, meals, samples, and materials, and carry heavy loads such as linen and trash. It has two configurations, i.e., fixed and secured carts as well as an exchange-based platform that can be used to carry racks, bins, and carts. The fixed carts are used for delivering drugs, and sensitive materials.



Berg:

Berg is a Boston-based biotech company and is one of the key players employing AI in its various processes. It has a huge database of patients and this is used to find as well as validate the various biomarkers responsible for causing diseases and then decide therapies according to the obtained data.

5) Applications of AI in pharmaceutical industry:

- 1 Pharma Companies have a positive outlook towards the integration of AI with their operation. Reports indicate that 70 % of businesses consider AI to become vital to their functioning with only 11% of businesses not considering an investment in AI.
2. Artificial Intelligence is helping the companies in developing new drugs in a faster, cheaper and effective manner.
3. AI techniques help scientists model numerous combinations of chemicals. It also helps them in preparing a model for observing and treating diseases.
4. AI has empowered the companies to process huge amount of data and draw useful inferences from data, AI enables them in handling a wide variety of scenarios based on proper reasoning.
5. Artificial Intelligence (AI) is helping the pharmaceutical and healthcare industry to enhance data processing and impacting almost every aspect of their work.
- 6 . The use of AI in the pharmaceutical industry for the design and development of drugs is increasing. From making small molecules to determining novel biological targets, AI plays a prominent role in drug target identification and validation. It is widely used for multi-target drug innovation and biomarker identification in an efficient way with great accuracy.
7. Pharmaceutical organizations can use [Artificial intelligence](#) to develop medicines Parkinson's and Alzheimer's and very rare diseases.
8. The technology is revealing some astonishing results for the healthcare sector and increasing the success rates of companies in the healthcare sector to higher most importantly the success rate in the research and development of crucial, life-changing drugs

CHALLENGES FOR ADOPTING AI IN PHARMA

Challenges that pharma companies face while trying to adopt AI:

- The unfamiliarity of the technology,
- Lack of proper IT infrastructure

Pharmaceutical firms have to spend lots of money to upgrade their IT system.

- Much of the data is in a free text format – that means pharma companies have to go above and beyond to collate and put this data into a form that's able to be analyzed. Despite all these limitations, one thing is for certain: AI is already redefining biotech and pharma.

ACKNOWLEDGMENT:

This paper and the research behind it would not have been possible without the exceptional support of DR. SUJITH ABRAHAM, Principal –KMCT college of pharmaceutical sciences. His enthusiasm, knowledge, and exacting attention to detail have been an inspiration and kept my work on track. Dr. MINU B PATTASSERIL, Vice-principal- KMCT college of pharmaceutical sciences, for her constant support from the beginning of my career in this institution, MAHIN MM, SANOOJA K, AND NIVYA MOHAN K my colleagues at KMCT college of pharmaceutical sciences, have also looked over my transcriptions and answered numerous questions with unfailing patience. The generosity and expertise of one and all have improved this study in innumerable ways and saved me from many errors; those that inevitably remain are entirely my own responsibility.

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