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OVERVIEW ON AI IN PHARMACY

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ABSTRACT

An answer to issues with numbers and data is artificial intelligence (AI). Numerous technological developments in almost every industry, including engineering, architecture, education, accounting, business, health, and more, have resulted from this discovery. AI has advanced significantly in the healthcare industry, having played important roles in the management and storage of data and information, including patient medical histories, medication inventories, sale records, and so forth; automated equipment; software and computer applications, including diagnostic tools like CT and MRI radiation technology, and many more, have all been developed to support and streamline healthcare procedures. AI has unquestionably transformed healthcare, making it more effective and efficient, and the pharmaceutical industry is not an exception. Drug development, dosage form design, poly-pharmacology, and hospital pharmacy are just a few of the significant pharmacy sectors that have seen a significant increase in interest in the application of AI technology in recent years.

KEYWORDS: *Artificial Intelligence, Pharmacy, Pharmacist*

INTRODUCTION

Artificial intelligence (AI) is the study of intelligent machine learning, or intelligent computer programs that provide results similar to the attention process of a human. Usually, this process includes gathering data, developing efficient methods for interpreting the data, illustrating exact or estimated results, self-corrections, and modifications. Machine learning analysis and cognitive skill mimicking are the usual uses of AI. Both useful interpretation and more precise analysis are made possible by AI technology. This perspective claims that artificial intelligence (AI) technology blends computational intelligence with a range of useful statistical models .[1]

With applications in a wide range of scientific and technological fields, artificial intelligence (AI) technology has recently become a crucial part of the industry. Over the past 25 years, pharmacies have done an excellent job of serving the growing demand for prescription pharmaceuticals, despite shortages of pharmacists, increased operating costs, and diminishing reimbursements. Additionally, pharmacies have done an excellent job of leveraging enabling technological automation to lower operating costs, improve workflow efficiency, and advance safety, accuracy, and efficiency across all pharmacy settings.

Data gathering, retail pharmacy management, clinical research, drug storage, pharmacy education, clinical pharmacy, and many other uses have probably been carried out by computers since the 1980s. It is impossible to forecast how much the pharmacy sector will change in the future due to the development of artificial intelligence. To assist physicians in diagnosing patients, a variety of expert systems have been developed. There have been several recent reports of programs centred around pharmacological therapy. They oversee drug interactions, drug therapy monitoring, and formulary selection. [2]

In addition to promoting awareness of artificial intelligence (AI) as a future aspect of pharmacy practice, these topics also cover the general overview and classification of AI, its applications in hospitals, the pharmaceutical industry, and retail pharmacies, and motivating pharmacists to embrace this advancement and do everything in their power to gain the skills they need to contribute to the eagerly awaited development.

AI GENERAL OVERVIEW

Artificial intelligence (AI), commonly known as machine intelligence, is often used interchangeably with robotics and automation. While robotics is just the building of machines that can perform difficult repetitive tasks, artificial intelligence (AI) is the exhibition of human-like behaviour's or intellect by any computer or machine. These "intelligent capabilities" were not usually built into robots, even if they might be able to move or transport objects on their own with the use of a properly designed program and surface sensors a process known as automation. The field of computer science known as artificial intelligence (AI) is essentially concerned with creating intelligent machines that are capable of performing tasks that are normally completed by people.[3]

Artificial intelligence (AI) is commonly employed in the development of digital computers or computer-controlled robots that are capable of performing intellectual and cognitive tasks that are comparable to those performed by humans alone. These cognitive and intellectual functions include perception, language, learning, reasoning, and problem-solving. The kind of AI currently in use is referred to as narrow AI or weak AI since it is designed only to perform certain tasks, such as voice and facial recognition, internet

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search, driving and car control, and so on. The ultimate goal of the AI community is to build computers that are capable of outperforming humans in any cognitive task when left to their own devices.[4]

AI Classification

AI can be classified in two different ways :

a) According to caliber
b) According to the presence

Classification of AI

Based on the caliber	Weak intelligence
	Artificial narrow intelligence
	Artificial general intelligence
	Artificial super intelligence
Based on presence	Type 1 reactive machine
	Type 2 limited memory system
	Type 3 is based on the theory of mind
	Type 4 self-awareness

Based on their caliber, AI system is classified as follows

- **Artificial General Intelligence (AGI) or Strong AI:** It is also known as Human-Level AI. It has the potential to simplify human intelligence. As a result, when given new tasks, it can solve them. AGI can perform every task that a human can.
- **Artificial Super Intelligence (ASI):** Brainpower is more active than intelligent humans in every field, from science to the arts, in fields like algebra, space, and sketching. The difference between a computer that is merely slightly smarter than a human and one that is trillions of times smarter is significant. [5]

Arend Hintze [18], an AI scientist classified the AI technology based on its presence and not yet present. They are as follows:

- **Type 1 :-** This type of AI system is known as a "reactive machine." In the 1990s, for example, the IBM chess program Deep Blue had an effect on chess champion Garry Kasparov. It can identify checkers on the chessboard and forecast outcomes, but it does not have the memory to rely on past experiences. It is ineffective in other situations since it was designed with specific purposes in mind. Another example is Google's AlphaGo.
- **Type 2:-** This type of AI system is known as a restricted memory system. This method can use past experiences to address present and future problems. Autonomous automobiles employ this method alone to build some of their decision-making processes. The stored observations are used to document future activities, such as changing lanes by automobile.
- **Type 3:-** Such AI systems are referred to as "theory of mind" systems. It suggests that each person has ideas, objectives, and desires that affect their decisions .
- **Type 4:-** They are known as self-aware. The AI systems possess sentience and self-awareness. If the machine is self-aware, it understands the circumstances and uses the ideas that other people have thought of. There is no such AI . [6]

Applications of AI

AI in diagnosis and targeted genomic treatments

AI is utilized in hospital-based health care systems in a number of ways, such as selecting accessible or suitable administration techniques or treatment plans and setting up dose forms for certain patients.

> **Maintaining of Medical Records:** Keeping track of medical records for patients is a difficult task. Implementing the AI system makes data collection, tracking, normalization, and storage easier.

> **Treatment Plan Designing :** Effective treatment methods are now possible because to AI technology. When a patient has a serious illness and selecting the best course of therapy becomes difficult, an AI system is needed to handle the situation.

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> **Assisting in Repetitive Tasks:** AI technology also aids in the diagnosis and identification of illnesses or issues by assisting with repetitive tasks like evaluating radiography, X-ray imaging, ECHO , ECG, etc. The Medical Sieve algorithm from IBM is a "cognitive assistant" that possesses powerful analytical and reasoning abilities.

> **Health support and Medication Assistance:** In recent years, AI technology has been recognized for its efficacy in providing health support services and pharmacological help. A start-up's virtual nurse, Molly, is given a warm face and a lovable voice . [7]

> **Accuracy of Medicine:** AI is beneficial to genomics and genetic development. By searching for patterns in genetic data and medical records, an artificial intelligence system known as Deep Genomics can identify mutations and links to illnesses.

> **Drug Creation:** It takes more than ten years and billions of rupees to research or produce pharmaceuticals. The molecular structure database can be used to determine remedies with the aid of an AI program called "Atom wise," which utilizes supercomputers. It started an internet search for a safe and effective way to treat the Ebola virus using currently accessible drugs.

> **Healthcare System Analysis**: Data retrieval will be easy if the entire healthcare system is automated. 97% of bills in the Netherlands are preserved in digital format [30], and they include hospital names, doctor names, treatment details. These can therefore be easily retrieved. [8]

AI and development of Pharmaceuticals

Prominent pharmaceutical companies are collaborating with AI vendors and integrating AI technology into their manufacturing processes for general drug discovery and research and development. Over 62% of healthcare organizations are reportedly contemplating investing in AI shortly, and 72% of enterprises believe AI will be crucial to their operations in the future. To better understand the industry's AI possibilities, Pharm News Intelligence investigates current AI use cases, the best uses for the technology, and the future of AI and machine learning. The application of AI and machine learning in the pharmaceutical sector might generate up to $100 billion annually for the US healthcare system, according to the McKinsey Global Institute.

Research is conducted daily to find new active ingredients for currently incurable diseases and ailments, enhance the safety profile of currently available pharmaceuticals, combat drug resistance, and lower the rate of treatment failure. This has led to an increase in the number and variety of biomedical data sets utilized in drug discovery and design. This and many more factors contributed to the development of AI in the pharmaceutical industry. These days, several companies offer software that is extremely pertinent to data processing, drug development, and forecasting treatment outcomes. [9]

DISCUSSION

The primary objective of AI applications in the healthcare industry is to examine the relationships between patient outcomes and preventative or therapeutic approaches. Customized medicine, medication research, diagnosis, treatment protocol development, and patient monitoring and care are just a few of the domains in which artificial intelligence (AI) technologies have been developed and applied. As the relevance of patient care continues to grow, pharmacists can use the on-going technological expansion to affect value-based outcomes in the following ways. Since pharmacies are the most accessible and affordable healthcare stakeholders, they can evolve from being solely locations to fill prescriptions into health management canter's. More specialized healthcare services, including counselling, recommendations, and a greater range of services, can be provided with the help of technology. [13]

By analyzing data and producing conclusions that enhance decision-making and eventually save lives, artificial intelligence (AI) holds the potential to save human labor, time, and money. Examples of medical and technological developments that have facilitated the development of AI in the healthcare sector include the general evolution of computers, which resulted in faster data collection and more powerful data processing; the expansion of the availability of health-related data from personal and healthcare-related devices and records; and the development of pharmacogenomics and gene databases. Electronic health records, natural language processing, and other computer advancements that have enabled machines to imitate human behavior have grown in popularity and use in industry. [10]

By assisting doctors in selecting the best cancer treatment from the many possibilities available, artificial intelligence (AI) from tech companies like Microsoft is gaining traction in the healthcare industry. By compiling data from many sources regarding the condition, AI is helping physicians find and choose the best drugs for the right patients. AI is helping researchers in the pharmaceutical sector make decisions regarding new treatments for a variety of illnesses and current drugs by selecting the right individuals from several data sources. Additionally, it is expediting the clinical trial procedure. Pharma is even trying to predict when and where epidemic outbreaks might occur with some degree of accuracy by using AI learning based on a history of previous outbreaks and other media sources. [11]

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CONCLUSION

Combining artificial intelligence with human resources and knowledge is known as artificial intelligence (AI). Even those who view AI as an enemy may come to view it as a necessary evil as research into the technology advances and more intriguing uses are developed. Consequently, it is highly advised that pharmacists obtain the necessary hard skills to support AI augmentation. All areas of pharmacy practice require exposure to and education regarding AI. During their PharmD studies, pharmacy students should be exposed to the foundations of AI and data science through a health informatics program. Additionally, pharmacists must be permitted to learn about AI through continuous education.

Pharmacists who want a more practical approach to AI development, governance, and application should have access to data science courses or pharmacy residencies that concentrate on AI themes. The pharmacy education system needs to stay flexible as new technologies develop quickly in order to guarantee that our profession is prepared to manage these changes in patient care.

List of Abbreviations

MRI - Magnetic resonance imaging
CT - Computerized tomography
ECHO - Echocardiogram
ECG - Electrocardiogram
DNA - Deoxyribonucleic acid
NHS - National health services
GSK - GlaxoSmithKline
GNS - Gene network sciences
MTM - Medication therapy management

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