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A Review on Artificial Intelligence

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Abstract: ***Artificial Intelligence (A.I.) is a multidisciplinary field whose goal is to automate activities that presently require human intelligence. Recent successes in A.I. include computerized medical diagnosticians and systems that automatically customize hardware to particular user requirements. The major problem areas addressed in A.I. can be summarized as Perception, Manipulation, Reasoning, Communication, and Learning. Perception is concerned with building models of the physical world from sensory input (visual, audio, etc.). Manipulation is concerned with articulating appendages (e.g., mechanical arms, locomotion devices) in order to effect a desired state in the physical world. Reasoning is concerned with higher level cognitive functions such as planning, drawing inferential conclusions from a world model, diagnosing, designing, etc. Communication treats the problem understanding and conveying information through the use of language. Finally, Learning treats the problem of automatically improving system performance over time based on the system's experience. Many important technical concepts have arisen from A.I. that unify these diverse problem areas and that form the foundation of the scientific discipline. Generally, A.I. systems function based on a Knowledge Base of facts and rules that characterize the system's domain of proficiency. The elements of a Knowledge Base consist of independently valid (or at least plausible) chunks of information. The system must automatically organize and utilize this information to solve the specific problems that it encounters. This organization process can be generally characterized as a Search directed toward specific goals. The search is made complex because of the need to determine the relevance of information and because of the frequent occurence of uncertain and ambiguous data.***

Keywords: Artificial intelligence, Target identification Target discovery, Drug Design Drug Discovery

I. INTRODUCTION

Artificial intelligence is a debatable subject because it involves topics like brain architecture and human intelligence, which we humans are oblivious to yet**.** Artificial intelligence is commonly used in computer systems using programs with proper computer hardware. Therefore, it generally looks like a science illusion story to unknowns. Artificial intelligence is sometimes called machine intelligence. Security and optimal performances can be improved and physical assets or oilfield equipment readily available through mobile asset tagging (Murray et al., 2006). LISP (List and Symbol Processing) and PROLOG (Logic Programming) are examples of that. Artificial intelligence studies are divided into two main categories: (ANNs) and classical Artificial intelligence (Gharbi and Mansoori, 2005). Artificial intelligence is one type of system which makes the computer and machine respond the same as human intelligence (Dodiya and Shah, 2021). Artificial intelligence techniques follow human-like capabilities e.g.: reasoning and learning. The reasoning is very much practical as the repetition and complexity of data increases. Artificial intelligence is a complex subject. It involves human intelligence and things that humans do not comprehend.

II. AI GENERAL OVERVIEW

The term AI (also known as machine intelligence) is very commonly confused and used interchangeably with robotics and automation. While robotics is simply the creation of machines that can carry out difficult repetitive tasks, AI refers to the exhibition of human-like behaviors or intelligence by any computer or machine[7]. Traditionally, robots were not built to possess these “intelligent capabilities” even though they may be able to move or carry objects independently using a designed program and surface sensors in a process known as automation. AI, in essence, is the field of computer science that specializes in the creation of intelligent machines, developed with the ability to perform tasks that will ordinarily be associated with a human being[8].

AI is frequently applied to the development of digital computers or computer-controlled robots with the capacity to autonomously execute intellectual and cognitive human-like processes. Such intellectual and cognitive processes include learning, reasoning, problem-solving, perception, and language. The form of AI currently in use today is referred to as narrow AI or weak AI because it is only designed to perform narrow tasks like internet search, facial and voice recognition, controlling and driving cars, and so on. However, the long-term goal of the AI community is to have machines that can autonomously outperform humans’ at all cognitive tasks. The AI that involves creating machines that can perform all human cognitive tasks will be the general AI or Strong AI (ADI)[9].

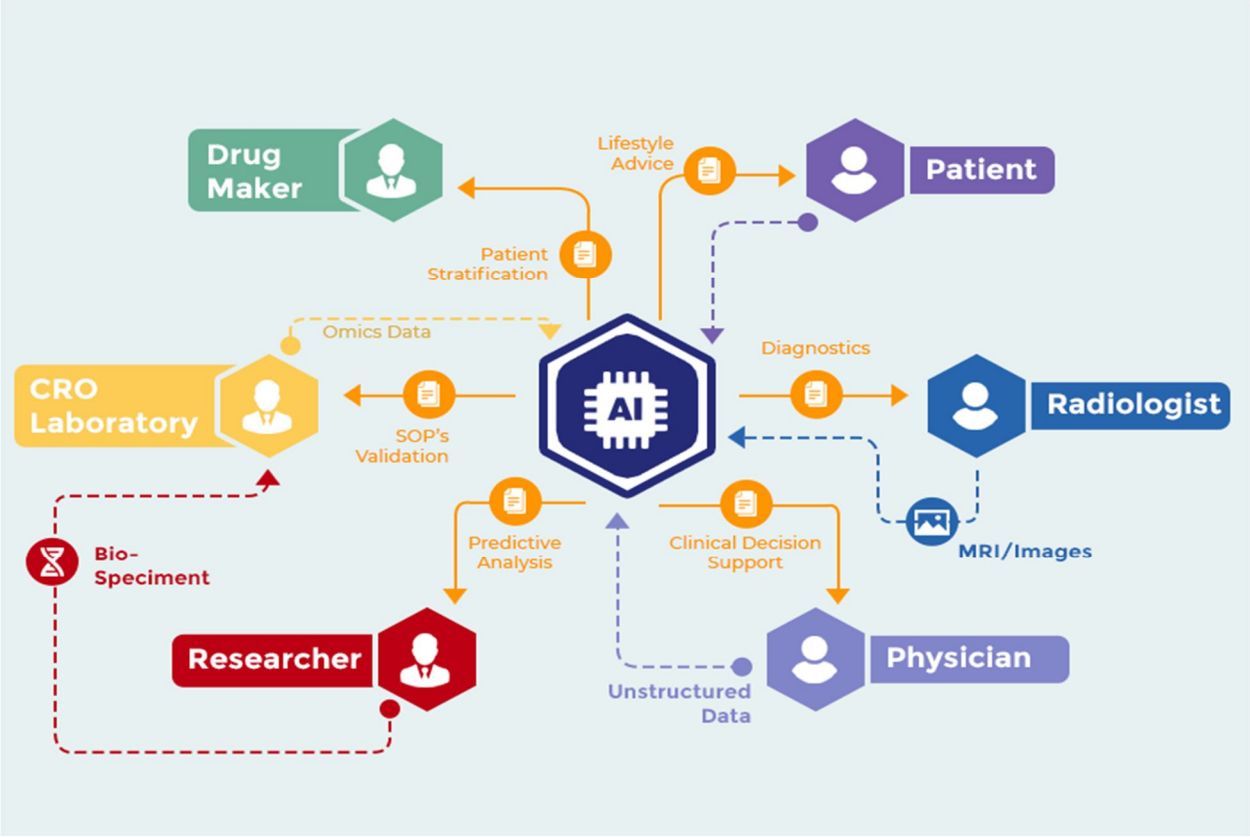
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A. AI Classification

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

1) Type 1: This type of AI system is called a Reactive machine. E.g. Deep Blue, the IBM chess program which hit the chess champion, Garry Kasparov, in the 1990s. It can identify checkers on the chessboard and can make predictions; it does not have the memory to use past experiences. It was designed for narrow purposes use and is not useful in other situations. Another example is Google's AlphaGo.
2) Type 2: This type of AI system is called a Limited memory system. This system can use past experiences for present and future problems. In autonomous vehicles, some of the decision-making functions are designed by this method only. The recorded observations are used to record the actions happening in the future, such as changing the lanes by car. The observations are not in the memory permanently.
3) Type 3: This type of AI system is called as "theory of mind". It means that all humans have their thinking, intentions, and desires which impact the decisions they make. This is a non-exist AI.
4) Type 4: These are called self-awareness. The AI systems have a sense of self and consciousness. If the machine has self-awareness, it understands the condition and uses the ideas present in others' brains. This is a non-existing AI.

B. Applications of AI



C. AI in Diagnosis and Targeted Genomic Treatments

There are several applications of AI in hospital-based health care systems[19, 20] in organizing dosage forms for individualized patients and selecting suitable or available administration routes or treatment policies.

1) Maintaining of medical records: Maintenance of the medical records of patients is a complicated task. The collection, storage normalizing, and tracing of data are made easy by implementing the AI system. Google Deep Mind health project[21] (developed by Google) assists to excavate the medical records in a short period. Hence, this project is a useful one for better and faster health care. The Moor fields Eye hospital NHS is assisted by this project for the improvement of eye treatment.

2) Treatment plan designing: The designing of effective treatment plans is possible with the help of AI technology. When any critical condition of a patient arises and the selection of a suitable treatment plan becomes difficult, then the AI system is necessary to control the situation. All the previous data and reports, clinical expertise, etc., are considered in the designing of the treatment plan as suggested by this technology. IBM Watson for Oncology[22], the software as a service, is a cognitive computing decision support system that analyzes patient data against thousands of historical cases and insights gleaned from working thousands of hours with Memorial Sloan Kettering Cancer Center physicians and provides treatment options to help oncology clinicians make informed decisions. These treatment options are supported by literature curated by Memorial Sloan Kettering, and over 300 medical journals and 200 textbooks, resulting in almost 15 million pages of text [22].
3) Assisting in repetitive tasks: AI technology also assists in some repetitive tasks, such as examining the X-ray imaging, radiology, ECHO, ECG, etc., for the detection and identification of diseases or disorders. Medical Sieve[23] (an algorithm launched by IBM) is a "cognitive assistant" having good analytical and reasoning abilities. A medical start-up is necessary for the improvement of the patient's condition by combining deep learning with medical data. A specialized computer program is available for each body part and used in specific disease conditions. Deep learning can be employed for almost all types of imaging analyses, such as X-ray, CT scan, ECHO, ECG, etc.
4) Health support and medication assistance: In recent years, the uses of AI technology are recognized as efficient in health support services and also, for medication assistance. Molly[24] (a start-up- designed virtual nurse) receives a pleasant voice along with a cordial face. Its aim of it is for helping patients to guide the treatment of patients as well as support them with their chronic conditions during doctor's visits. Ai Cure[25] is an app existing in a Smartphone webcam, which monitors patients and assists them to control their conditions. This app is useful to patients with severe medication situations and for patients who participate in clinical trials.
5) Accuracy of medicine: AI shows a good impact on genomics and genetic development. Deep Genomics[26], an AI system is useful for observing patterns in the genetic information and medical records to identify the mutations and linkages to diseases. This system informs doctors about the events happening within a cell when DNA is altered by genetic variation. An algorithm is designed by the father of the human genome project, Craig Venter[27] that gives information on patients' physical characteristics based on their DNA. "Human Longevity" AI technology is useful to identify the exact location of cancer and vascular diseases in their early stage.
6) Drug creation: The development or creation of pharmaceuticals takes more than a decade and consumes billions of rupees. "Atom wise"[28], an AI technology that uses supercomputers, is useful to find out the therapies from the database of molecular structure. It hurled a virtual search program for safe and effective therapy for the Ebola virus with the existing drugs. The technology identified two drugs that caused Ebola infection. This analysis was completed within one day compared to months to years with manual analysis. A Biopharma company in Boston developed big data for the management of patients. It reserves data to find the reasons why some patients survive diseases. They used patients' biological data and AI technology to find out the difference between healthy and disease-friendly atmospheric conditions. It helps in the discovery and design of drugs, healthcare, and problem-solving applications.
7) AI helps people in the health care system: The "open AI ecosystem"[29] was one of the top 10 promising technologies in 2016. It is useful to collect and compare the data from social awareness algorithms. In the healthcare system, vast information is recorded which includes patient medical history and treatment data from childhood to that age. This enormous data can be analyzed by the ecosystems and gives suggestions about the lifestyle and habits of the patient.
8) Healthcare system analysis: In the healthcare system, if all the data is computerized then retrieval of data is easy. Netherland maintains 97% of invoices in digital format[30], which contain treatment data, physician names, and hospital names. Hence, these can be retrieved easily. Zorgprisma Publiek, a local company analyses the invoices with the help of IBM Watson cloud technology. If any mishap occurs, it recognizes it immediately and takes the correct action. Because of this, it improves and avoids patient hospitalization.

III. AI IN PHARMACEUTICALS

AI in pharmaceuticals is the use of artificial intelligence to revolutionize drug discovery, development, and manufacturing, by analysing vast datasets to accelerate processes, improve efficiency, and personalize medicine. Key applications include identifying drug candidates, optimizing clinical trials, enhancing supply chain management, and predicting drug efficacy and toxicity.

A. Core Applications

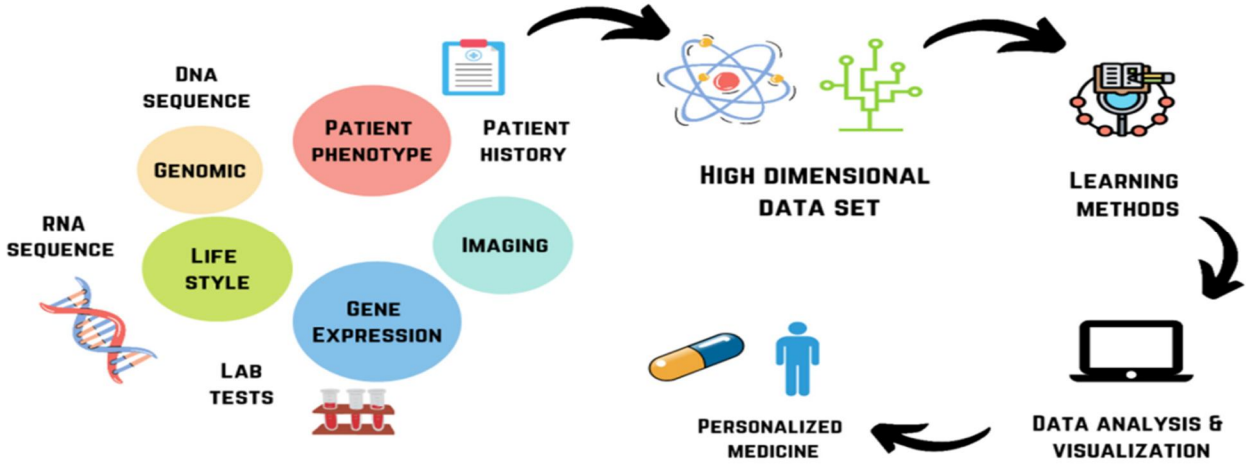
1) Drug Discovery: AI analyses large biological and chemical datasets to identify disease targets, design novel molecules, and predict a drug candidate's properties, which significantly speeds up the discovery process.

2) Clinical Trials: AI is used to optimize trial design, improve participant recruitment by analysing patient data, and monitor trials more effectively for safety and efficacy.

3) Personalized Medicine: AI analyses individual patient data to create customized treatment plans, aiming for better outcomes and fewer adverse reactions.

4) Manufacturing and Supply Chain: AI optimizes supply chain logistics by forecasting demand and managing inventory, while in manufacturing, it helps monitor equipment for predictive maintenance and ensures product quality.

5) Pharmacovigilance: AI analyses data to detect adverse drug reactions, improving patient safety by enabling earlier detection of side effects



IV. BENEFITS AND CHALLENGES

A. Benefits

AI can substantially reduce development costs and time, leading to faster market entry for new medicines. It also creates opportunities for new therapeutic solutions and personalized treatments.

B. Challenges

Adoption can be slower in pharma due to strict regulations. Other challenges include the "black box" nature of some AI models, the potential for algorithmic bias that could lead to unequal outcomes, and the need for transparency in AI decision-making.

The future

- AI is expected to continue transforming the pharmaceutical industry, leading to more efficient and widespread drug discoveries.
- Companies are increasingly partnering with AI firms to accelerate research and development.
- While AI-generated drugs have not yet received FDA approval, some are entering clinical trials, showing progress in this area.

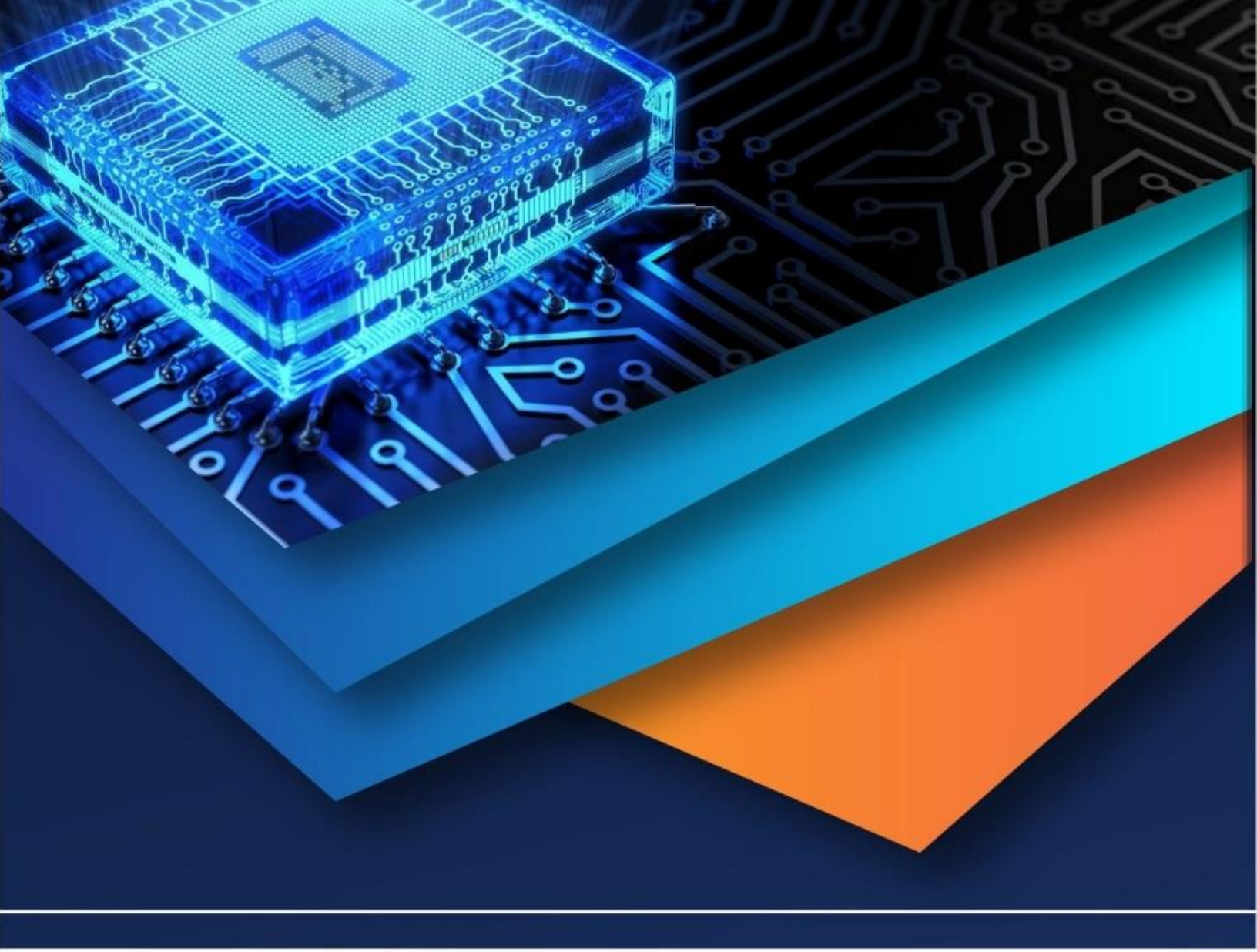
V. CONCLUSION

AI involves the combination of human knowledge and resources with Artificial Intelligence. As research into AI continues, with many interesting applications of it in progress, one may consider it a necessary evil even for those that see it as an enemy. Therefore, it is strongly recommended that pharmacists should acquire the relevant hard skills that promote AI augmentation. Education about and exposure to AI is necessary throughout all domains of pharmacy practice. Pharmacy students should be introduced to the essentials of data science and fundamentals of AI through a health informatics curriculum during their PharmD education. Pharmacists must also be allowed to develop an understanding of AI through continuing education. Data science courses or pharmacy residencies with a focus on AI topics should be made available for pharmacists seeking more hands-on involvement in AI development, governance, and use. As these technologies rapidly evolve, the pharmacy education system must remain agile to ensure our profession is equipped to steward these transformations of care.

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