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Need for Artificial Intelligence in Pharmaceutical Industry and its Limitations

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Abstract

AI is often being touted as the means to bring about the fourth Industrial Revolution and its role in almost all sectors of our society is almost certain. This brings about an urgent need for evaluating benefts and limitations of AI and machine learning across various sectors. Pharmaceutical industry has pioneered in embracing the use of AI in all of its core areas but the success as of yet seems very limited. The major advantage of AI is that it reduces the time that is needed for drug development and, in turn, it reduces the costs that are associated with drug development, enhances the returns on investment and may even cause a decrease in cost for the end user along with improved drug safety. So in this article we will review the scope and limitations of AI in the pharmaceutical industry.

Keywords: AI; Drug discovery; Drug design; ML; Clinical trial

Introduction

Arti cial intelligence is the simulation of human intelligence patterns and processes by machines and computer systems. As a general rule, AI frameworks work by breaking down large amounts of speci ed training data for correlations and patterns, and using these patterns to make forecasts about future states.

AI programming focuses on the following cognitive skills:

a) Learning

b) Reasoning

c) Self-correction

d) Planning

e) Knowledge representation

f) Automated decision making

All through the world, countless investigations are being done on AI [1]. A lot of cash is being pumped in to make a framework that can work inde nitely more productively and at a substantially less time than a typical individual. Be it an educational setup, a manufacturing rm, a government o ce, or a research rm; AI nds itself relevant in each eld. Examples of AI include speech recognition, language processing, self-driving cars, personalised social media feeds, personalised web searches.

Applications of AI in Pharmacology and why it is needed in Pharmacology

Drug developmen

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accuracy, can help overcome complications and barriers in patient-speci c approaches. AI can also boost nano-medicine design process by optimising material properties according to predicted interactions with the target drug, biological uids, immune system, vasculature and cell membranes, all in uencing therapeutic e cacy [4].

3) AI can prove to be instrumental in quality control, quality assurance and automated manufacturing protocols and thereby preventing wastages and streamlining pharmaceutical manufacturing processes and supply chains [5].

4) Clinical trial design and monitoring- arguably one of the most time consuming processes in drug discovery is participant recruitment for clinical trials. AI and ML can help in enrolment, matching/ strati cation and protocol designing for clinical trials and consequently save a lot of time and money. Moreover, AI can help monitor ongoing trials and ensure adherence to protocols and compliance among the participants. An added advantage with AI and digitisation of clinical trials is that these trials are no longer geo-restricted and as a result the outcome will be more globally representative rather than to a particular ethnic cohort [6].

5) Marketing- like all the industries, pharmaceutical industry too needs to have marketing strategies. AI is already used by many e-commerce sites for e ective marketing and this same strategy can bene t the pharmaceutical industry immensely [7].

6) Prediction of toxicity- e prediction of the toxicity of any drug molecule is vital to avoid toxic e ects. Cell-based in vitro assays are o en used as preliminary studies, followed by animal studies to identify the toxicity of a compound, increasing the expense of drug discovery [8].

7) Pharmacovigilance- AI and ML can and will play a pivotal role in speedy and cost e ective processing of ICSR (Individual Case Safety Report) and PMS (Post Marketing Surveillance) data, enabling better drug safety and personalised therapy (Figures 2 and 3).Figures 3hing/

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