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(REVIEW ARTICLE)

Digital drug intelligence based on AI

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Abstract

Artificial Intelligence is the branch of computer science which elaborates all the sectors in science and technology from Fundamental engineering to medicinal science. This review focused on different techniques and different types of technologies such as Activity relationship technologies, virtual screening, support vector machines, Recurrent Neural network including various different parameters. Pharmaceutical industry used AI for designing plan of treatment and helps in people health care. They reduce human work by using different tools while there are various challenges faces to work on AI.

Keywords: Activity relationship technology; Drug designing; Development process; Production of medications; Neural Networks

1. Introduction

The future of AI in pharmacy is expected to bring transformative changes, including advancement in precision making, generative AI for drug development and enhance patient monitoring. The integration of AI in hypothesis generation represents a significance advancement in computer science research. It will revolutionizing virtual screening in pharmacy by enhancing the efficiency and accuracy of drug discovery processes. Through the application of sophisticated algorithms and data-driven methodologies, researchers can expedite the identification of promising drug candidates with enhanced precision, ultimately contributing to the advancement of therapeutic solutions for patients.

When highlighting the field of pharmacy, the role of Artificial Intelligence (AI) cannot be ignored due to its vast applications in various aspects of the industry. In the evolution of pharmaceutical medications, AI is utilized to select appropriate bulking agents, choose suitable development techniques, and ensure that parameters are met for optimal yield during the process. [1]

In medical management, tasks such as prior authorization, updating patient records, and billing, which are repetitive, can be efficiently handled using AI technology. In future Artificial Intelligence techniques can help for the various works such as Machine Learning and Natural Language Processing, are also employed in opinion research, market research, and value monitoring.

This given review discussed the importance significance of Artificial Intelligence in different areas. [2]

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2. Digital Therapy/ Personalized treatment

2.1. Radiotherapy

- Retina
- Cancer
- Other Chronic Disorders

2.2. Drug Discovery

The process of discovering effective new drugs is challenging and largely the most difficult aspect of drug development. [3]

2.3. Forecasting of epidemic/ pandemic

The accuracy of forecasts made before the peak of the epidemic largely relies on obtaining valid parameter estimates. [4]

There are various Artificial Intelligence-based quantitative structures, such as:

- **Activity relationship technologies**: This powerful technology is used in drug discovery to guide the possession or combination of desirable new compounds, as well as to further characterize existing molecules. used to forecast various biological activity from molecular structure.

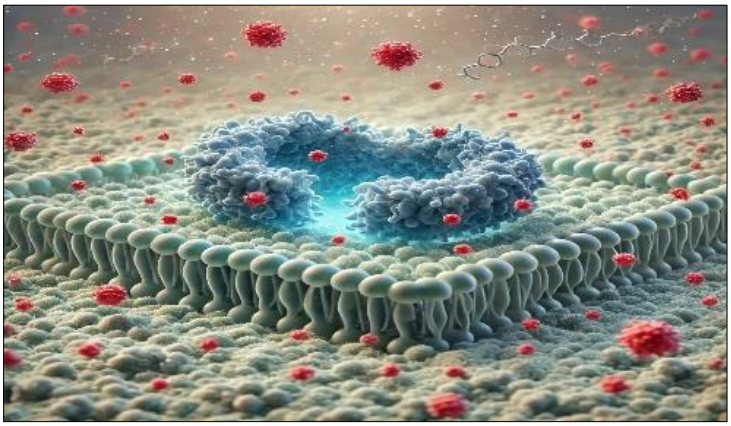

Figure 1 Activity relationship technologies

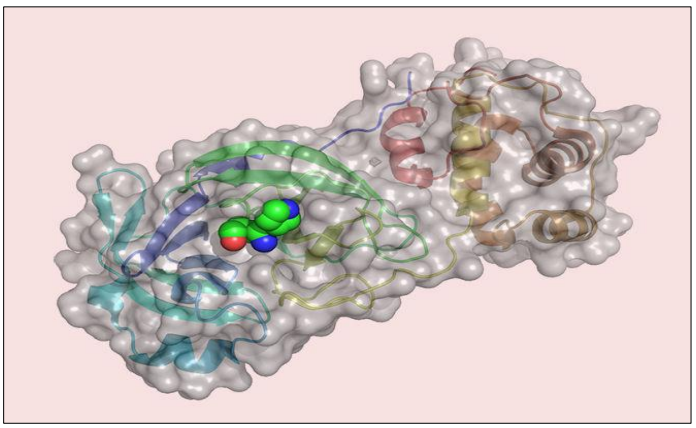

Figure 2 Virtual Screening

- **Virtual screening**: It can also optimize the molecular pharmacokinetic properties and toxicity of natural products, thereby increasing the probability of successful drug discovery. By using computational programs, virtual screening can rapidly evaluate a large number of compounds and natural products at a lower cost.
- **Support vector machines**: The support vector machine (SVM) algorithm is one of the most widely used machine learning (ML) methods for predicting active compounds and molecular properties. In chemo informatics and drug discovery, SVM has been a state-of-the-art ML approach for over a decade.

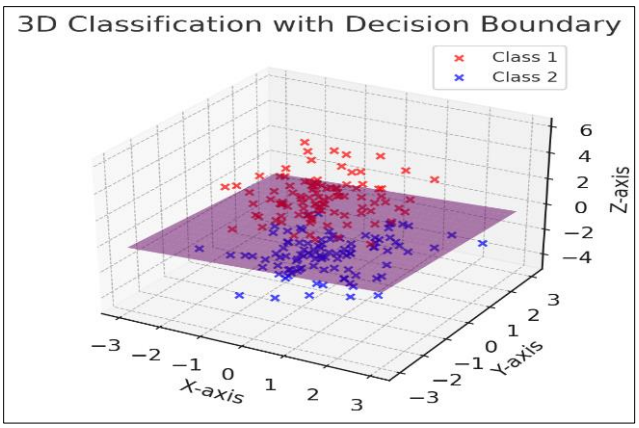

Figure 3 Support vector Machine

- **Recurrent Neural network:** Recurrent neural networks (RNNs) are a class of artificial neural networks designed for sequential data processing. Unlike feedforward neural networks, which process data in a single pass, RNNs process data across multiple time steps, making them well-suited for modelling and processing text, speech, and other sequential data.

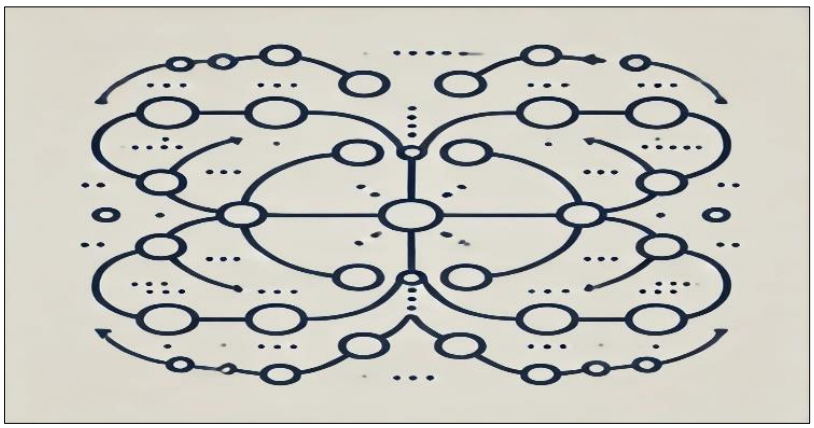

Figure 4 Recurrent Neural Network

3. Applications of artificial intelligence in pharmacy

- **Treatment plan designing**: The effective design of treatment plans in pharmacy is achieved with the help of artificial intelligence (AI) technology. There are various patients with critical health conditions where proper treatment planning becomes challenging. In such cases, AI technology plays a crucial role in overcoming these difficulties.

AI suggests various approaches to treatment planning based on previous patient data, medical reports, and clinical expertise. For example, IBM Watson for Oncology is a software program based on AI technology. It serves as an advanced analytical support system that examines patient data and recommends treatment plans by comparing them with hundreds of historical cases.

This demonstrates how AI technology contributes to treatment planning in the field of pharmacy.

- **Drug Creations:** The evolution and development of pharmaceutical drugs have taken many years and consumed billions of rupees. However, with the use of artificial intelligence (AI) technology in drug creation, supercomputers are utilized to design various types of drugs. Through AI-driven analysis of multiple atomic structures, researchers can identify effective therapies. This demonstrates how AI plays a crucial role in drug development, helping to discover treatments for various diseases.
- **AI helps people in the health care system:** In 2016, the Open Artificial Intelligence Ecosystem was recognized as one of the top 10 promising technologies. It played a crucial role in comparing and collecting information related to social consciousness descriptions. [5]

4. Artificial intelligence tools in pharmacy

There are various Artificial Intelligence (AI) tools used in the field of pharmacy that significantly reduce human effort, simplify tasks, and save time through efficient techniques.

4.1. Drug development

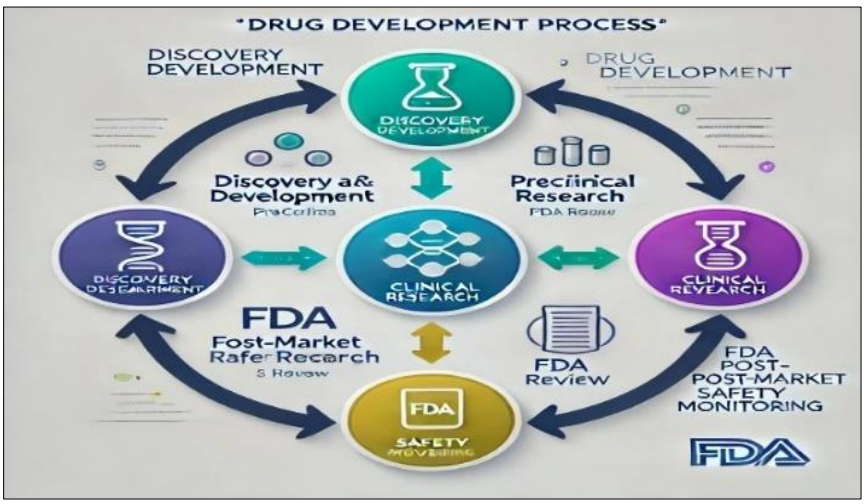

Figure 5 Drug Development

AI has the capability to transform the drug discovery process, enhancing efficiency and precision while speeding up drug development. [6]

- **Preclinical Research** Preclinical research acts as a bridge to therapeutic intervention, enabling large-scale evaluation of new ideas, drugs, techniques, or technologies before their use in human participants, thereby enhancing the chances of successful clinical trials and implementation. [7]
- **Clinical Research** Clinical trials play a crucial role in developing new medical treatments, but they often involve risks such as patient mortality, adverse events, and enrolment failures, which can lead to the loss of significant efforts over a decade or more. [8]
- ***FDA Review:*** An FDA-cleared artificial intelligence (AI) algorithm incorrectly identified a finding as an intracranial haemorrhage in a patient who was ultimately diagnosed with an ischemic stroke. This case underscores a critical failure mode of AI tools, highlighting the significance of human-machine interaction. [9]
- **The Customer services**: Customer service satisfaction with an outpatient pharmacy service at a VA medical centre improved following the implementation of several quality-improvement initiatives. [10]
- **Workflow Automation*:*** Workflow management systems, a relatively new technology, are developed to enhance efficiency, integrate diverse application systems, and facilitate interorganizational processes in electronic commerce applications. [11]

5. Current pharmaceutical challenges and the role of artificial intelligence:

In various pharmaceutical industries, extensive research on micro molecules is conducted to optimize medication production, ultimately leading to greater consumer satisfaction due to positive results. The treatment of rare diseases using micro molecules faces competition from genetic molecules, requiring extensive compound data, along with multiple clinical trials, for successful initiation.

Biomolecules are rapidly advancing in the pharmaceutical industry. These large molecules, primarily composed of amino acids from protein sources, have led to highly successful products such as insulin and albumins. For biomolecules, pharmacokinetics plays a crucial role, though they are highly complex, and infusion is the preferred route of administration.

The development of these molecules and the study of their pharmacokinetics present significant challenges. However, with the help of new technologies, human expertise is leveraged for issue analysis, effective decision-making, and cross-verification. Artificial Intelligence (AI) is capable of solving these complex tasks, reducing human workload and enhancing efficiency. [12]

6. Conclusion

Artificial Intelligence (AI) in the pharmaceutical field enables the use of advanced machines, reducing human effort in medicinal processes. AI tools help accelerate the production of medicines in pharmaceutical industries, allowing for increased efficiency in a shorter time due to this advanced technology.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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