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Review article

Artificial intelligence in drug delivery

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ABSTRACT

Artificial intelligence (AI) tools are improving the drug delivery process from drug formulation to stimulating, Programming and optimising drug delivery in patients. Artificial intelligence (AI) it is the emerged powerful tool to minimise patient compliance. Healthcare, including drug delivery. It is the transformation of the pharmaceutical product to improve patient care. In that, improved patient adherence. This review provides the various AI-dependent approaches in pharmaceutical technology, tools, highlighting their benefits, and recent trends in AI in novel drug delivery systems.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Deep Learning, Drug Discovery, Personalised Medicine.

INTRODUCTION

Artificial intelligences defined as a computer-based simulation of human intelligence processes, has achieved notable advancement across diverse field including drug delivery. AI are the developed innovative system for targeted drug delivery of therapeutics with maximal efficiency and minimal side effects. These are control drugs delivery and overcoming or reducing the challenges in drug delivery systems, such as systemic toxicity, narrow therapeutic index, and long-term therapy. AI is an emerging sector in almost all fields [1].

Drug Delivery

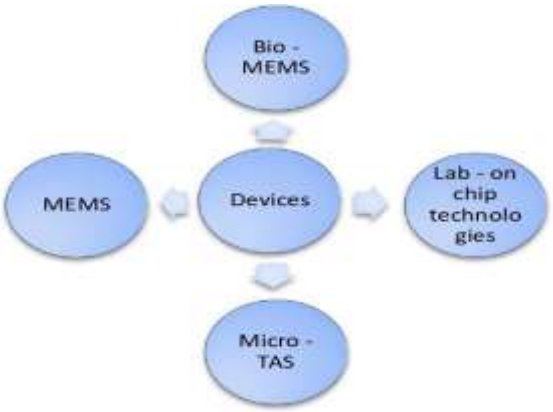
Drug delivery improves treatment in many ways, including enhancing therapeutic efficacy, reducing toxicity, increasing patient compliance, etc [2].

Figure 1: Drug Delivery

Role of artificial intelligence

AI are various micro – processing technique have emerged, including photolithography, light film development, deposition, and bonding derived from the fabrication of organised circuits. These techniques have been instrumental in upgrading existing devices or inspiring thecreationentirely new devices across various fields [3].

Figure 1: Devices



Benefits

Improved decision

Reduced errors

Automation

Unbiased decision

Improved customer

Enhanced safety and security

Personalized education

Improved healthcare

Data analysis [4].

Artificial intelligence for drug delivery

The alliance or combination of big data in the field of pharmaceutics. This accelerates drug development timeline, reduces costs and increases production. The use of AI and measurable pharmaceutics involves modelling drug delivery systems at the different scales, ranging from molecular interactions to microscopic behaviour. The utilisation of AI can optimise drug delivery systems. It's including prediction of the drug behaviour within the body. The anticipation of drug interaction and the enhanced drug formulation. The capability proves valuable in the design of drug delivery. AI has played a significant role in the optimisation of drug delivery systems. These various applications of AI-based drug delivery, such as [5].

Figure 3: AI for drug delivery

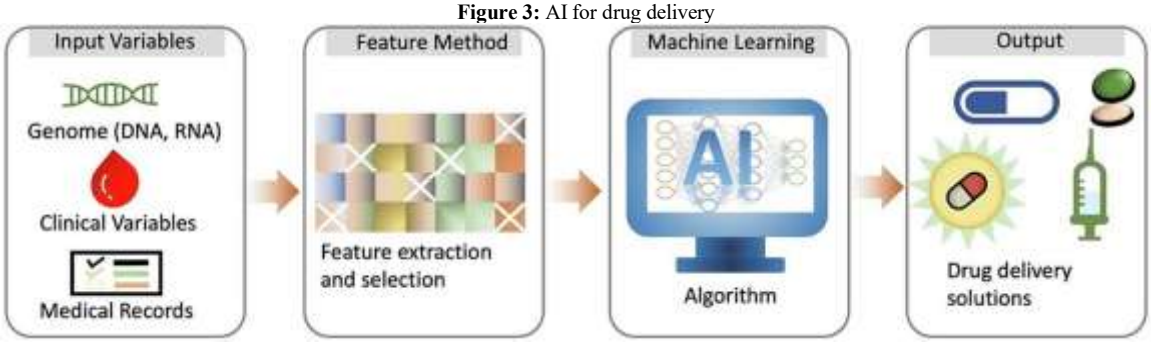
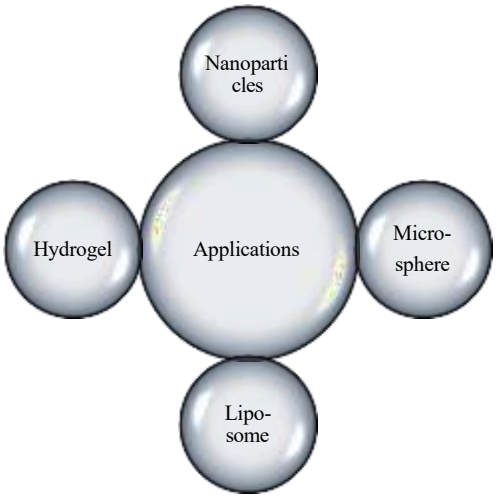


Figure 4: Application



Nanoparticles

It can be defined as the dispersal of particles or solid particles that have a size ranging from 10-1000nm. The drug can be either be dissolved, trapped, or enclosed to a nanoparticle matrix.

Microsphere

Microsphere represent a category of drug delivery systems that possess the ability to facilitate targeted drug distribution.

Liposome

AI is currently employed in the development of liposomal drug delivery systems [6].

Hydrogel

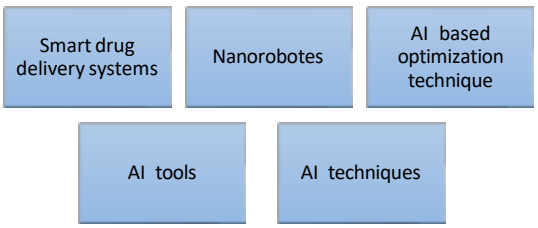
It polymeric networks involved hydrophilic nature, enabling them to absorb significant quantities of water or biological fluid.

Smart Drug Delivery Systems

These are Nan platforms that can release of drugs targeted to the body. They can react to internal or external stimuli.

AI is used in drug delivery in several way

Figure 5: Drug delivery in several ways



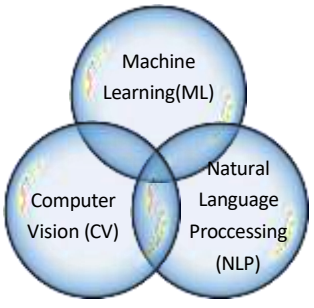
Nanorobotes

These can navigate to targeted sites based on physiological conditions such as PH. They can be used to deliver drugs and genes [7].

AI-Based Optimization Techniques

These can be used to explore different combinations of drugs to maximize efficacy, minimize side effects, and improved patient compliance.

Figure 6: Techniques of AI



AI Tools

These can perform searches, stimulations and defilements of data and processes. They can also help explore drug models, drug release and activity predictions [8].

AI Techniques

These include Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), and Generative Modelling (GM) [9].

Techniques of AI

Machine Learning (ML)

ML is an AI technique that uses datasets, algorithms and artificial neural networks to learn and improve overtime. It uses training data to mimic the human learning process.

Computer vision

Computer vision to understand visual data from videos and images. It aims to extracts information from visuals and use that's data to find patterns or take actions.

Natural Language Processing (NLP)

NLP is a field of AI that uses text to create meaningful interaction between machines and humans. These abilities make NLP useful in almost every industry.

Recent trends in AI in Novel drug delivery systems

It's capability to completely transform of a pharmaceutical delivery through the optimization of drug design the enhancement of drug targeted and the improvement of drug release. Recent trends in AI-driven drug delivery systems have emerged.

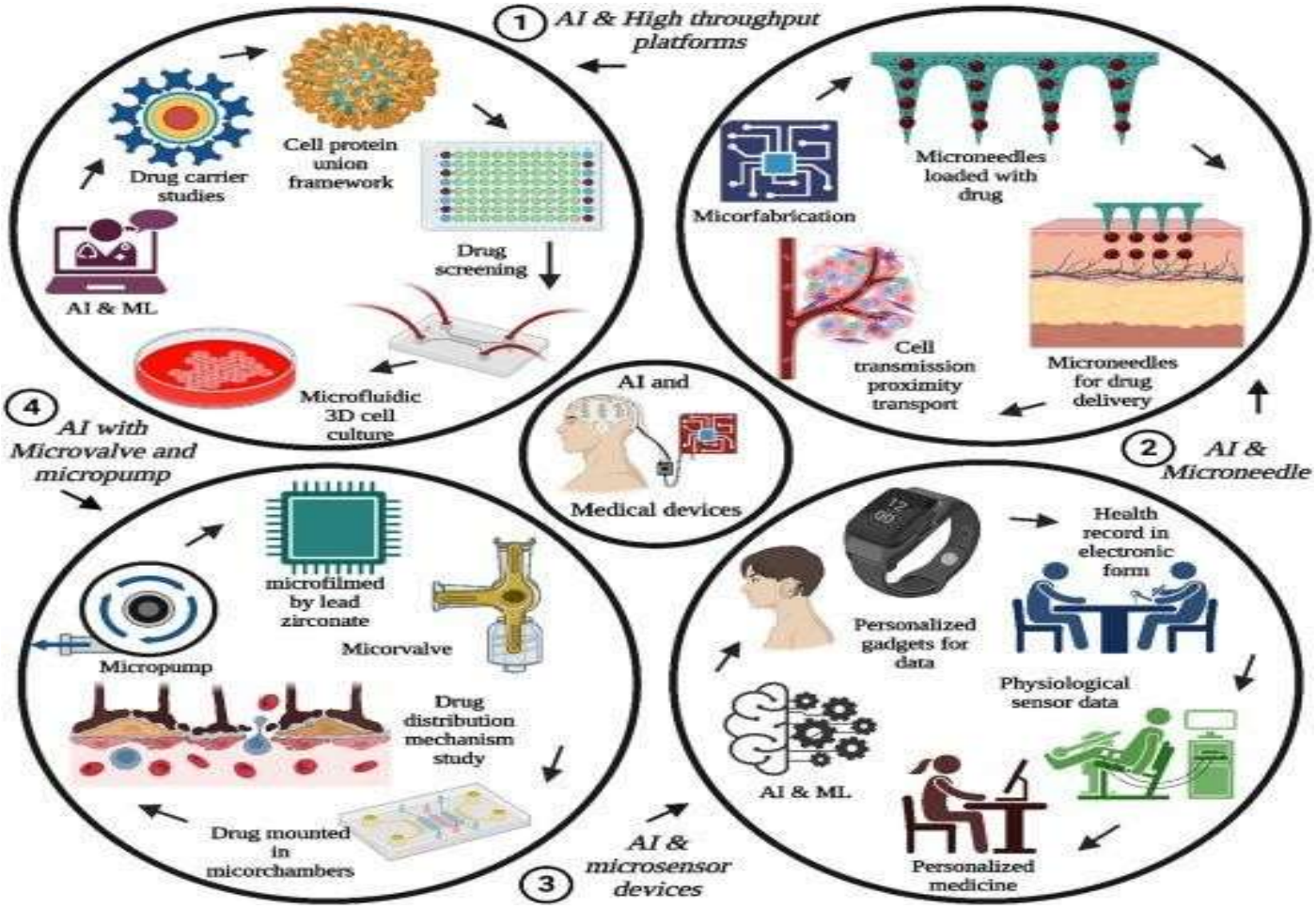
Machine learning for drug discovery.

Nanoparticles based drug delivery systems.

Predictive models for drug release.

Smart drug delivery systems.

Personalized medicines [10].



Drawbacks

CONCLUSION

AI powered drug delivery systems can improve drug efficacy, reduce side effect and enhance patient's outcomes. These are use of AI in novel drug delivery systems has theta revolutionize the field of medicine. The most significant worry regarding AI is joblosses.AI would become an invaluable tool in the pharmaceutical industry in the near feature.

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