



What is Artificial Intelligence?

Artificial intelligence (AI) has the potential to transform the pharmaceutical industry. There are a growing number of applications that address target and drug discovery, preclinical and clinical development, and post-approval activities using AI technologies. The use of AI in life sciences, especially in the field of drug discovery, is set to become widespread within the next decade.

Within life sciences, AI is applied to four major approaches:

- **Machine learning:** Processes that analyze input data and then repeatedly optimize their methods based on generated outputs
- **Deep learning:** A machine-learning-based approach that utilizes a logic structure akin to biological neural networks
- **Natural language processing:** A refined automatic speech recognition system that is able to interact with people through dialogue, going beyond simple reactions to well-stylized user requests

- **Robotics and the internet of things:** Integration of devices to collect, combine and share different types of information

Drug R&D is a very complicated, costly and time-consuming attempt. AI and machine learning used in the early stages of drug discovery and development has the potential for various needs. Through big data analysis and other technical means, this AI-powered drug discovery platform can quickly and accurately mine data and select the appropriate lead compounds. Compared with traditional methods, AI system can help customers save the cost of screening candidates by tens of billions every year, which can be widely used in various scenarios regarding drug development.

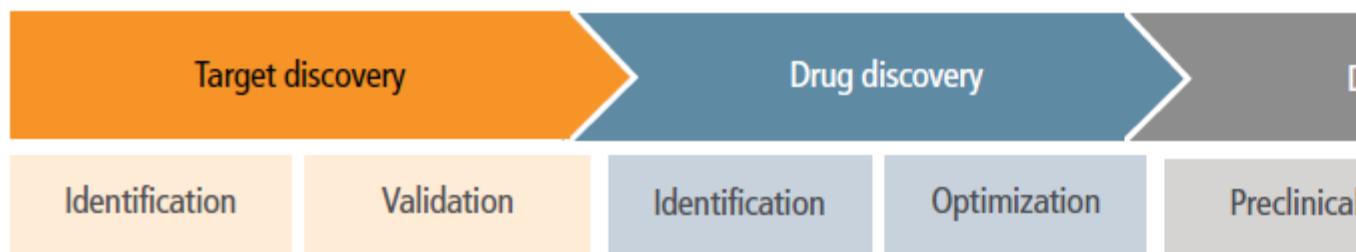


Figure 1 Drug Lifecycle



Application Scenarios

- **Drug Target Discovery**

Through Natural Language Processing (NLP) and based on a large number of medical literature and relevant data, AI system is very efficient in finding the relationship between drugs and diseases, and

specifying effective targets. Automatically aggregate and analyze literature data to identify and refine drug leads and related target patients, AI-driven solutions can greatly shorten the period of drug R & D.

- **Candidate Drug Discovery**

Use big data and machine learning methods to automatically design millions of small molecular compounds related to specific targets, and screen compounds according to efficacy, selectivity, ADME and other factors.

- **Prediction of Drug Crystal Form**

Relying on deep learning and cognitive computing, AI-powered drug crystal form prediction is capable of predicting all possible crystallographic patterns of a small molecule drug.

- **ADMET Prediction**

Prediction of ADMET is an important step in drug design. With a combined use of research technology and computer simulation, the early discovery and screening process can be quickened. Meanwhile, existing drugs can be repurposed and re-studied as well.

- **Design and Optimization of Clinical Trials**

The AI system can be used to guide clinical trials and data collection.

Different biomedical and healthcare data streams can be transformed into computer models which represent individual patients.

- **Patient Screening and Recruitment**

This attempt can maximize the success possibility of clinical trials. AI also plays a role in patient screening and recruitment. It can more accurately match patients and quickly complete patient recruitment using in-depth research of disease data. Clinical processes can be optimized such as monitoring of patients by analyzing their data using AI methods. AI applications have also been developed for compliance monitoring and marketing optimization.

- **Pharmacovigilance**

The combined use of supercomputers, AI and complex algorithms can simulate the pharmaceutical process to predict the effect of new drugs, find potential drug-related side effects earlier so as to reduce the cost of R&D.



Key Trends and Considerations in Pharma's Operating Approach

- ■ Partnerships with AI companies: Benefit from each other.
- ■ Data sharing: Forming partnerships to share data between pharma companies, helps to optimize the potential benefits of AI
- ■ Algorithm transparency with regulators: It helps regulators to better understand the processes behind AI-powered conclusions.

- ■ Data privacy: companies must build up appropriate legal and compliance measures to protect patient's data.
- ■ Intellectual property protection: foreground and background IP, the ownership of trained model/derived data, the exploitation rights, etc.

AI & Medicine, a division of Protheragen, proudly announced that it has successfully developed a unique artificial intelligence (AI) drug discovery platform, offering drug research and development solutions for medical institutions and pharmaceutical enterprises worldwide.

Reference

1. Clay Heskett, et al. Artificial Intelligence in Life Sciences: The Formula for Pharma Success Across the Drug Lifecycle. L.E.K. Consulting / Executive Insights, Volume XX, Issue 60.