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Editorial Open Access

Artificial Intelligence in Drug Discovery and Development

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Editorial

Artificial Intelligence (AI) has recently been developed into a sizzling topic in the area of medical care industry. The biopharmaceutical industries are making efforts to approach AI to enhance drug discovery process, reduce research and development expenses, diminish failure rates in clinical trials and ultimately generate superior medicines. The accessibility of immense statistics in life sciences and a speedy development in machine learning algorithms led to an evolution of AI-based start-up companies focused on drug discovery over the recent years [1]. Numerous remarkable AI-biopharmaceutical alliance were declared in 2016-2017 that include Pfizer and IBM Watson, Sanofi Genzyme and Recursion Pharmaceuticals, AstraZeneca, Abbvie, Merck, Novartis, GSK and Exscientia, etc.

The area of AI came to subsistence in 1956 at Dartmouth College summer workshop, 'The Dartmouth Summer Research Project on artificial Intelligence' which was the seminal event for artificial intelligence as a field [2,3]. During the 1970s, several biomedical AI-based systems were developed, such as, Internist-1 [4], CASNET, PIP and MYCIN. In 1985, XCON was created which was the first system that had overwhelming commercial success leading to a million-dollar industry. In the early 1990s, the field of AI expanded in terms of exponential growth in high-performance computing (Moore's law), data communication (the internet), cloud technologies (Salesforce, AWS, EC cloud, apps, etc.) and big data storage. In 1997, Deep Blue (IBM's supercomputer) defeated Garry Kasparov in chess, and that brought AI into a limelight. Since then, the arena of AI is expanding exponentially and investments in artificial intelligence for drug discovery are rising. Sanofi has signed a 300 million dollars deal with the Scottish AI start up. Exscentia and GSK did the deal for 42 million dollars. Also, the Silicon Valley VC firm Andreessen Horowitz hurled a 450 million dollars bio investment fund, with one focus area in applications of AI to drug discovery.

AI has stimulating opportunities to flourish in the biopharmaceutical arena. The current AI initiatives by the top biopharmaceutical companies include (a) Mobile platform to improve health outcomes-the ability to recommend patients by means of real-time data collection and thus improve patient outcomes. (b) Personalized medicine-the ability to evaluate big database of patient so as to recognize cure options using a cloud-based system. (c) Acquisitions galore-New start-up companies are combining the artificial intelligence and healthcare to nourish the innovation requirements of large biotech firms. (d) Drug discovery-Pharma companies in conjunction with software companies are trying to implement the most cutting-edge technologies in the costly and extensive process of drug discovery.

Bloomberg Technology has reported that Microsoft has developed an artificial intelligence based machine to support doctors in finding proper cure for cancer [5]. Microsoft has been working on a project to launch a machine called Hanover. The aim of this machine is to memorize the available information database required to treat cancer and thus help to predict the amalgamation of drugs that will be most efficacious for the diagnosis of individual patient. One such project is based on the use of AI in the therapy of a fatal cancer named myeloid leukemia. Alternative study shows that researchers at Stanford University have developed an AI based algorithm that can identify skin cancer as good as a professional doctor. The program uses a technique known as deep learning for recognizing nearly 130,000 images of moles, rashes, and lesions [6] which helps to identify skin cancer with great accuracy. Another example include scrutinize multiple high-risk patients using artificial intelligence. In this process, each patient is asked several questions based on data assimilated from live interactions between doctor and patient [7]. In December 2016, IBM in collaboration with Pfizer introduced IBM Watson, a cloud-based platform for drug discovery. It allows users to analyze personal data such as medical lab reports and helps researchers with the ability to identify potential relationships between distinct data sets through dynamic visualizations.

IBM Watson, an artificial intelligence based computer created by IBM, for answering queries presented in natural language. IBM Watson has defeated human intelligence to a certain extent and won the quiz show Jeopardy against earlier champions, Brad Rutter and Ken Jennings [8]. It has also successfully diagnosed a woman who was suffering from leukemia [9]. In February 2013, IBM announced the first commercial application of Watson software system that would be for utilization management decisions in lung cancer treatment at Memorial Sloan Kettering Cancer Center, New York City, in union with health insurance company WellPoint [10]. CNN stated one of the recent studies by surgeons at the Children's National Medical Center in Washington who productively demonstrated surgery with an autonomous robot. The team supervised the robot while it performed stitching together a pig's bowel during open surgery in an effective manner as claimed by the monitoring team [11].

AI appears to be transforming the future of healthcare field but still it has to make an impactful outcome. At present, there are no AI-inspired, FDA-approved drugs in the market. Also, it is vital to comprehend that although AI-based data analytics can introduce novelty at every tier of drug discovery and development process, yet it cannot serve as a replacement for experimental processes such as chemical synthesis, clinical trials, regulatory approvals and production stages. Nevertheless, AI can upgrade and expedite research and development efforts, diminish the time and expense of early drug discovery, and support to predict potential toxicity risks/side effects at late-stage trials that could be very valuable in avoiding dreadful events in clinical trials.

AI can provide radical ideas for medication and therapies through data retrieved from genomics, proteomics and other life science disciplines that could bring advancement in the drug discovery and development process. The modern technological milieu in combination with existing machine learning algorithm/artificial neural network techniques provides exhilarating opportunities for major biopharmaceutical industrial revolution in the forthcoming years. The requisiteness to start implementing AI technologies in the biomedicines can be a breakthrough for the future market sustainability of biopharmaceutical organizations.

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