Uses of AI in Pharma R&D Today

This extract is taken from Proventa's longer AI in R&D White Paper. To read the full sector White Paper, including its expert look into AI's current uses in pharma and whether AI is enough to reduce pharma's R&D decline, click, click here.

When the AI revolution began, many in pharma believed that it would play out as had the internet revolution before: not only failing to bring down R&D costs but actually increasing them. Due to this, some companies were resistant to the notion of deep learning and AI.

This is changing, however: In 2017, Verdict AI ran a survey in which more than 70% of pharmaceutical companies said AI would be very important to them in the near future.

AI is having an increasing impact on pharmaceutical operations, with its possible uses many and varied. Examples of areas in which the new technology can have a big impact include data mining, predicting the effects of treatments and in new company acquisitions. Off the back of our recent White Paper on AI in R&D, we thought we'd showcase some of the uses for AI in the field today.

Mining and Analysing Data

Analysing data from patients, clinics, literature and other sources to find research ideas can hugely change the pharmaceutical industry. Focusing on peer-reviewed, validated data ensures ML algorithms learn correctly and are more accurate, while validation of these simple, structured sources should be a relatively simple thing to do, allowing for updates to the algorithm to be made easily and quickly.

Regarding analysis, AI can work wonders in this area also: current use examples include BMS' collaboration with Concerto HealthAI, which uses new tech to analyse real-world oncology data; and Novartis' digital transformation, which includes the creation of a predictive analytics platform to assess clinical trial operations.

Determining Patterns and Drug Repurposing

Nowadays, the overwhelming use of sophisticated AI software within pharma is to detect patterns more quickly and efficiently than humans can. Both Bayer and Merck, for example, use algorithms to analyse image findings from lung perfusion, cardiac and pulmonary vessels, as well as patient notes, to determine risk of diseases such as pulmonary hypertension and allow experts to diagnose individuals earlier for better outcomes.

A good example here is Atomwise, which has used deep neural networks to analyse simulations of molecules, saving scientists time in testing the real thing. In 2015, it used its algorithms to determine which molecules could bind to a certain glycoprotein to treat Ebola. Since 2015, repurposed drugs count for around 2% of all pharmaceutical revenue: by 2020 the market is expected to reach $31.3 billion, up from $24.4 billion five years ago. AI is a facilitator of this boom: while drug repurposing has been conducted for a while, both through knowledge-based discovery and through experimentation, often these are limited in resource and scope.

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AI approaches can change this. Such methods are done by training ML algorithms to mine data from a number of different sources, including scientific literature, health records, clinical trials and phenotypic information. Unlike previous methods, AI-based drug repurposing can integrate many different types of data and reveal connections that otherwise would be extremely difficult to determine.

The benefits of such a process are self-evident: the use of drugs already in service removes the need for a second phase one trial, where safety is tested, and renders unnecessary all the cost and time a company usually spends in designing and developing a novel drug. The potential for FDA fast-tracking also speeds up the entire process, and creates the possibility of a much swifter turnaround time for a drug than normal. That said, the AI systems here are only as useful as the datasets they mine: greater industry collaboration and access to new datasets are needed before AI can fulfil its full potential in drug repurposing.

Predicting Treatments' Effects

One of the more complex current uses of AI is to test how drugs will impact patients: automated gathering and analysis of patient data can help understand potential side effects of new drugs, mapping out genes responsible for disease and better predicting how patients will react to treatment. One of the companies pioneering this technology is Verge Genomics.

This application of AI today leads into another: drug dosage optimisation, where analysed data can quickly and efficiently determine the exact level of drugs needed by a patient for a given illness.

Remote Monitoring

A newer use of AI is that of patient monitoring: smartphone apps, wearable devices and even particular keyboards can be used to monitor and interpret patient usage and wellbeing, in some cases reducing assessments of conditions such as motor function from half an hour to a tenth of that time. The need for this technology is evident: a high percentage of patients with chronic conditions still fail to take their medication, compromising the effectiveness of treatment and damaging health outcomes. This becomes even more important an issue due to the increasing complexity of clinical trials in recent decades, requiring even more scrutiny of patients within them.

The AI methods of monitoring patients remotely are numerous: companies have found success through encouraging patients to take clinical-quality images remotely from their phones, using 'smart keyboards' to register patient keystrokes and activity, or use wearable Apple watches to monitor a range of health information as the patient goes about their day-to-day business.

Automation

Many large companies are also using the increased computing power to automate many previously laborious tasks: Amgen, Pfizer and Novartis, for example, have collaborated with MIT to automate small molecule discovery and synthesis; Genpact is working with Bayer to automatically extract adverse event data from source documents; and Sanofi has allegedly partnered with Researchably to cut reviews times by automating medical literature reviews.

The year of AI will be distinguished from what has gone before it by the innovation and complexity seen in the next wave of AI in pharma. Pharmaceutical companies will no longer be content to integrate broad AI solutions to their business, supplementing existing processes but not radicalising their internal structure. Now, real and company-wide change will be effected as AI becomes a crucial, all-encompassing part of every company that intends to compete in the sector.

To read the full White Paper on AI in R&D, **click here**.

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