The Many Ways Pharma Industry Is Benefitting from Artificial Intelligence

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Artificial Intelligence (A.I.) has revolutionized many industries as we speak, which doesn't exclude pharmaceuticals. However, unlike other sectors concerning Information Technology, Automotive, Entertainment, and the likes, pharma was reasonably slow in adopting the futuristic technology but getting there nonetheless. The slow acceptance and incorporation of A.I. within pharma owes to the blatant uncertainty of what might work and what won't help discover and develop new drugs.

Fast forward to 2020, and we do see the pharma and biotech industry using various subsets of A.I. like machine learning and incorporating data-driven decisions. Unlike A.I. depicted in science fiction movies, particularly the famous 'I, Robots' where the AI-infused robots are out there for our throats, the reality is much brighter and safer.

A.I. within the pharma and other industries focus on solving particular problems and assisting in conducting tasks using automated algorithms. If A.I.'s purpose in pharma could be narrowed down, then we can say that A.I. helps where humans cannot help themselves. Meaning, using A.I. for data mining and to analyze vast amounts of data for finding hidden patterns, loopholes, and information that a human eye and brain might have missed on. This helps determine new ways of treatment and drug discovery that the humans would have otherwise missed out on the opportunity.

Furthermore, three types of A.I. have been adopted widely by the pharma and have been working as expected, driving many giant businesses forward. Those three include Data Science, Machine learning, and Deep Learning.

Data science algorithms: This type of A.I. uses multivariate data analytics that includes the support of previously existing data and experimental values. Further, this includes using a cluster of data of, let's say, treatment outcomes and combining it with individual patient's clinical data along with medical history to come up with alternative possibilities of treatment and drug combinations that might work for that particular patient.

Machine Learning: A subset of A.I. that relies on neural networks. A neural network includes a series of algorithms that have the ability to recognize underlying relationships in a set of data through a process that mimics the human brain operations. Neural networks also refer to neurons found within the human mind.

Machine learning uses data-driven algorithms that allow the software to become great at predictive analysis and help the outcomes without even being explicitly programmed.

Deep Learning: Deep learning is a subset of machine learning that also operates on neural networks but has an added layer of calculations along with combined signals. Deep learning is great for diagnostic uses as it can accurately analyze images and determine the possibilities of any present anomaly.

Deep learning has this ability as it has been exposed to a vast amount of data and previous records for the software to be able to judge the abnormal from, let's say C.T. scans.

Applications of A.I. within the pharma industry are many, and some even have been applied successfully. So, moving on to the many roles A.I. has been and could be performing within the healthcare sector includes the following:

1. Manufacturing Process improvement
2. Drug Discovery and Design
3. Processing Biomedical and Clinical Data
4. Rare Diseases and Personalized Medicine
5. Identifying Clinical Trial Candidates
6. Drug Repurposing

The future of biopharma is bright and optimistic, considering the pace of technology and its progress.

The AI-driven transformation of the pharmaceutical industry

If we speak about the statistics, then the biopharma market is projected to reach $10B by 2024. The U.S. is the biggest pharmaceutical market globally, with the Asia Pacific taking the second position. Moreover, the pharma industry has some of the highest profit margins globally; why wouldn't they, apart from the obvious fact, that they also happen to spend big money on advertising. As much as the industry makes a profit, they also have a new drug costing around $2.6 million.

Let's get to the uses of A.I. within the pharma industry and explore how this industry is to grow further and by large margins.

1) Manufacturing Process improvement

A.I. is already playing a great deal of importance within the supply chain area. It won't be any surprise that it provides opportunities to improve the processes within the pharma sector. So what does it include when we say processes. It means quality control, shorten design time, reduced material waste, performing predictive maintenance, and much more. This alone poses so many improvements for big pharma and medical facilities that have many processes running simultaneously.

This is why the A.I. machine learning algorithms ensure that the tasks are being performed precisely and without any fault. Additionally, it also helps you analyze the areas and any vulnerabilities that may need strengthening to streamline the work even further.

The machine learning software's efficiency and accuracy allow the companies and manufacturers to waste less raw materials and fasten the production alongside consistently meeting the product's Critical Quality Attributes (CQAs).

2) Drug Discovery and Design

COVID-19 pandemic has really highlighted the pending issue of faster and more effective drug development. For this very need, A.I. plays an integral role in making new drug discovery easier with its many subsets as discussed above, doing the hard work for the humans and shortening the timeline of the drug hitting the market.

Drug discovery is an arduous process; it begins with the hypothesis and determination of the target molecule. After target identification and validation, follows lead optimization steps. This process includes identifying the hit molecules concerning the target and then fixating on the 'top' molecule to take the process forward.

Although the process is elaborate and costly, not to mention time-intensive, even with the best resources allocated to generating lead compounds, there is always an uncertainty that the drug could potentially fail to progress to the next level of development.

This is where A.I. comes in with automation harboring the potential to transform the drug development process completely. New technologies alongside A.I., such as robotics and microfluidics, mixed with automated data analysis, can fasten the drug development and approval process, thereby shortening the time to market frame.

3) Processing the Biomedical and Clinical Data

This is, by far, one of the best uses of A.I. so far. Its algorithms are designed in a way that they can process a large volume of data, learn it, and then provide the accurate results of your desire. In pharma, this is a blessing as professionals concerning the life sciences industry, be it life sciences consulting or life sciences researchers, either way, they are helped in examining the enormous amounts of data that is presented to them, so they can quickly validate or discard the hypothesis made by many of the research publications.

Coming to the clinical data then, unfortunately, many of such valuable data is still recorded in logs and registers to date, which isn't the most convenient and is prone to human errors. Lucky for them, A.I. can interpret handwritten notes and various other scans quite easily for any organization to migrate to a digital AI-enabled software solution swiftly.

So, A.I. fastens up the research process and even faster cross-referencing of data.

4) Rare Disease and Personalized Medicine

As we mentioned, the A.I. in pharma can go through heaps of data and even scans to develop proper analyses that the human eye may otherwise have missed.

The researchers at the University of Bonn and the Charité -- Universitätsmedizin Berlin have shown that the A.I. can be used to diagnose rare diseases at a much faster, reliable, and efficient rate. The scientists trained the neural network with 30,000 portrait pictures of people that are affected by a rare genetic disease. "In combination with facial analysis, it is possible to filter out the decisive genetic factors and prioritize genes," says Prof. Dr. med. Dipl. Phys. Peter Krawitz. He also added," Merging data in the neuronal network reduces data analysis time and leads to a higher rate of diagnosis."

A.I. is also being used to detect diseases like cancer and even predict the possibility of patients developing cancer later on. Moreover, A.I. can even predict any possible diseases that the patient might face, given their genetic makeup.

To explain this, consider this example of IBM Watson for Oncology, which runs an A.I. program and uses each patient's medical treatment and history and curates personalized treatment plans.

Imagine the tremendous leap that the pharma industry would make that would improve the lives of the patients. Their revenue would boost, considering they will be manufacturing customized medication and treatment options.

5) Identifying Clinical Trial Candidates

We mentioned that A.I. helps make sense of the clinical trial data, but what more A.I. does it take a bit further and helps find those trial patients. How? It uses advanced predictive analysis that includes data like genetic information to determine which one fits the bill more closely for the trials.

Such automation and automated systems structure the trials' foundation and allow the timeline to reduce considerably, elevating the success chances by a large margin. According to the researchers, the system's machine learning component also helps it learn from historical data to learn, analyze, and improve its future recommendations. A lot of the analyses is handled by smart A.I. algorithms designed to solve the given problems by perfuming a set sequence of specified actions.

However, according to the researchers, the system hasn't fully matured. There are a small number of limitations involved in smart recruitment for clinical trials and issues concerning the system's accuracy at

interpreting data. Of course, given the age of this technology, slowly but surely, the problems will be resolved.

6) Drug Repurposing

Finding new cures for an old drug is how this can be explained in a one-liner. Take the example of 'Pharnext' that, with the help of machine learning, is dedicated to searching for therapeutic uses for off-patent medications.

When we speak about drug repurposing, we have a different spin on it. AI-based technology can deliver significant value as previously known drugs can do wonders when geared towards other diagnoses. This strategy can work out for the companies looking to use their available drugs. Moreover, this will also add to the fact there will be less spending on R&D.

Cohen, the driving force behind Généthon, the French laboratory that introduced Big Data and automation to the study of genomics, said, **"you don't need to design new drugs," he added, "With 50 drugs, we can treat everything."**

Cohen and his esteemed team of experts are also leveraging A.I. to discover new therapies with the idea of repurposing the existing drugs, thereby reducing the hefty cost of a couple of billions that take in the discovery of the new drug.