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# Artificial Intelligence in the Pharmaceutical Industry – An Overview of Innovations.

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**ABSTRACT:**

The productivity of the pharmaceutical industry is on the decline. Failure rates in clinical trials exceed 90% after therapies are tested in model organisms, and the cost to develop a new drug exceeds $2.6 billion. Recent advances in artificial intelligence (AI) may help to reverse this trend and accelerate and improve pharmaceutical R&D. While the term AI and the concept of deep learning are not new, recent advances in high-performance computing, the availability of large annotated data sets required for training, and new frameworks for implementing deep neural networks (DNNs) resulted in an unprecedented acceleration of the field. Since 2014, DNNs have surpassed human accuracy in image, voice and text recognition, autonomous driving, and many other tasks.

Early presentations to the pharmaceutical industry on the advances in deep learning in 2014 and 2015 resulted in skepticism and were discarded. In 2017, many pharmaceutical companies started partnering with AI startups and academics or started internal R&D programs. From training DNNs on transcriptional response data for predicting the pharmacological properties of small molecules and biomarker development, to the generation of novel chemistry, deep learning techniques rapidly propagated into many areas of biomedical research.

Keywords:  Artificial Intelligence, Innovation, drug design and development, transforming pharma, Global Market.

## INTRODUCTION:

Artificial Intelligence (AI) is a rapidly growing technology that is used for a wide range of applications across industries. Small, mid-sized, mid-sized, and multinational companies are using AI technology and enhancing their capabilities to work smart in this digital sphere. Like retail, e-commerce, and manufacturing sectors, AI is gaining prominence across healthcare and pharma sectors. Leveraging the power of this modern Artificial Intelligence in Pharma Industry, the companies are finding innovative ways to resolve some of the significant issues that the pharma sector is facing today. Yes. AI-powered apps using machine learning, deep learning, predictive analytics, and big data have brought a radical shift in the paradigm of pharma. Artificial intelligence in Pharmaceutical Industry has the potential to promote innovation, while at the same time increasing productivity and providing better results. In addition, Artificial Intelligence in Pharma Industry offers a value proposition to the companies by creating new and latest business models. You can observe AI implementation in almost every aspect of the pharmaceutical field. From drug discovery and development to drug manufacturing to supply chain and marketing, AI has its impact. Hence, AI in Pharmaceuticals and Healthcare ensures cost-effectively operations, business efficiency, and hassle-free approvals for new drugs. We learn more about benefits of artificial intelligence in pharmaceutical industry as well.

## Historical Background

| Year | Comment |
|---|---|
| 1943 | AI was done By Warren McCulloch and walter pits. They propose G model of Artificial Neurons . |
| 1949 | Donald Hebb demonstrated an undating Rule for connection strength Between Neurons and that Rules Called Hebbian learning |
| 1950 | Alan Turing publishes "Computing Machinery and Intelligence"and he proposed test called as Turing Test. |
| 1955 | Allen Newell and Herbert A. Simon Created "First artificial Intelligence program" and named as ''Logic Theorist". |

| 1956 | The word "Artificial Intelligence"Firstly adopted by John McCarthy at the Dartmouth conference. |
|------|--------------------------------------------------------------------------------------------------|
| 1966 | Joseph Weizebaun created first Chatbot named as ELIZA. |
| 1972 | First Intelligent Humoid Robot was built in Japan and named as WABOT -1. |
| 1980 | First National conference of the American Association of Artificial Intelligence Was held at Stanford University. |
| 2002 | AI entered in form of Roomba a Vaccum Cleaner. |
| 2006 | Facebook ,twitter and Netflix Started Using AI. |
| 2012 | Google has launched an Android App features ''Google Now''. |
| 2014 | Chabot "Eugene Gootman an " Won completion in ''Turing Test''. |
| 2018 | ''Project Debater ''from IBM debated with two Master Debates . <br> Google has Demonstrated an AI program ''Duplex ''which was a virtual assistant. |
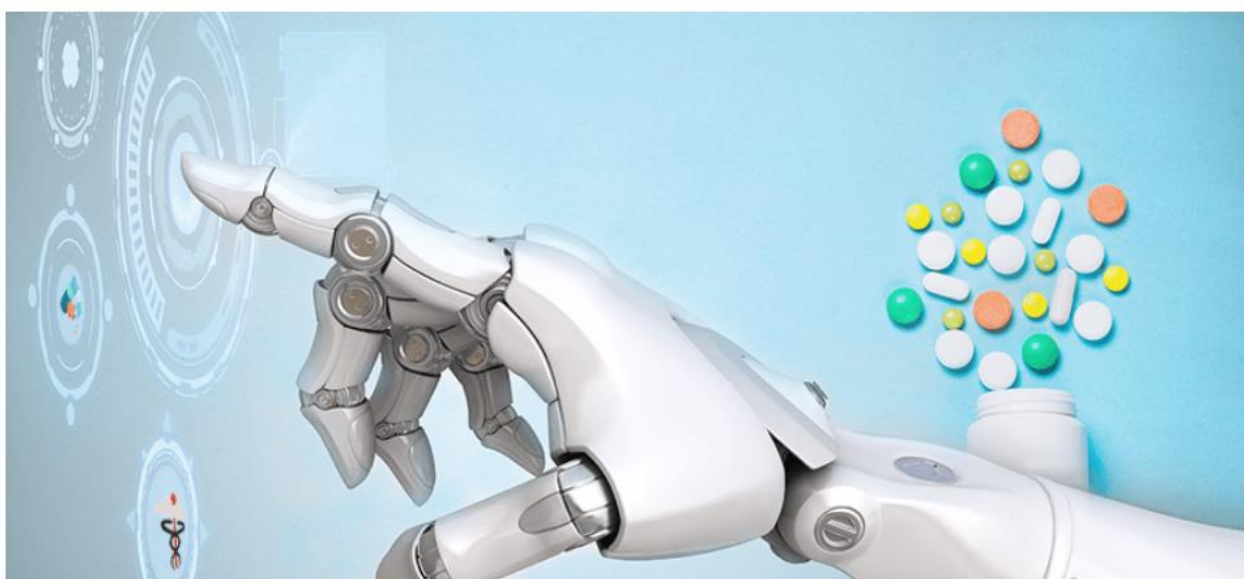


## IBM Research Uses Advanced Computing to Accelerate Therapeutic and Biomarker Discovery

Over the past decade, artificial intelligence (AI) has emerged as an engine of discovery by helping to unlock information from large repositories of previously inaccessible data. The cloud has expanded computer capacity exponentially by creating a global network of remote and distributed computing resources. And quantum computing has arrived on the scene as a game changer in processing power by harnessing quantum simulation to overcome the scaling and complexity limits of classical computing

### *Improving the Drug Discovery Value Chain*

Innovation in the healthcare and life sciences, while overall a linear process leading from identifying drug targets to therapies and outcomes, relies on a complex network of parallel layers of information and feedback loops, each bringing its own challenges (Fig. 1). Success with target identification and validation is highly dependent on factors such as optimized genotype–phenotype linking to enhance target identification, improved predictions of protein structure and function to sharpen target characterization, and refined drug design algorithms for identifying new molecular entities (NMEs).
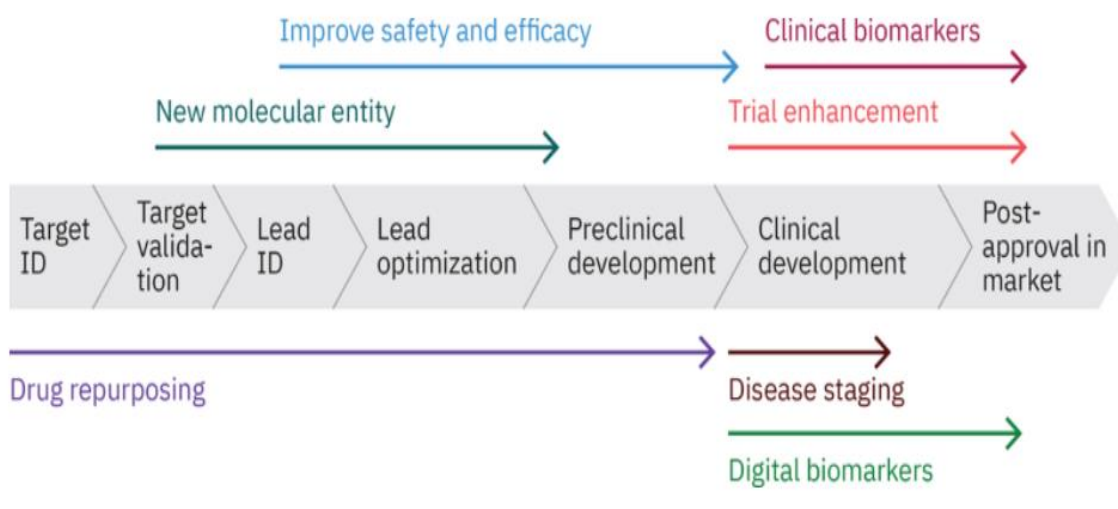
### Optimized Modeling of Nmes

Developing new drugs hinges on both the identification of new disease targets and the development of NMEs to modulate those targets. Developing NMEs has typically been a one-sided process in which the in silico or in vitro activities of large arrays of ligands would be tested against one target at a time, limiting the number of novel targets explored and resulting in 'crowding' of clinical programs around a fraction of validated targets. Recent developments in proteochemometric modeling—machine learning-driven methods to evaluate de novo protein interactions in silico—promise to turn the tide by enabling the simultaneous evaluation of arrays of both ligands and targets, and exponentially reducing the time required to identify potential NMEs.
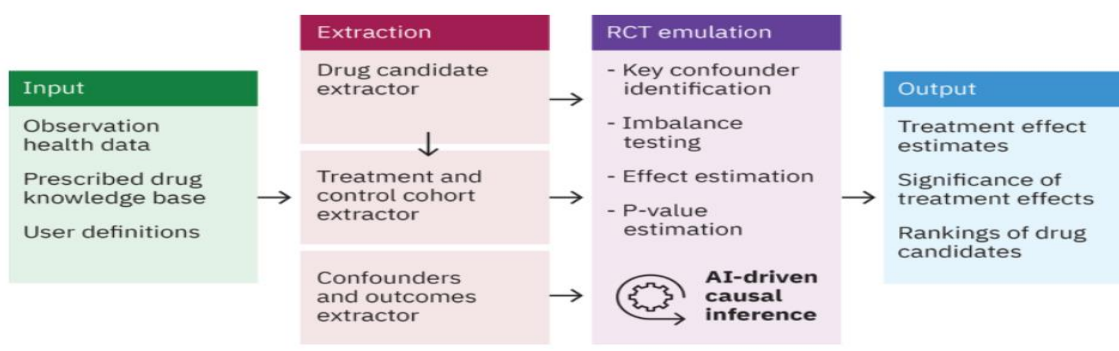


### Drug Repurposing from Real-World Data

Electronic health records (EHRs) and insurance claims contain a treasure trove of real-world data about the healthcare history, including medications, of millions of individuals. Such longitudinal datasets hold potential for identifying drugs that could be safely repurposed to treat certain progressive diseases not easily explored with conventional clinical-trial designs because of their long time horizons.

### Enhanced Clinical-Trial Design

One of the main bottlenecks in drug discovery is the high failure rate of clinical trials. Among the leading causes for this are shortcomings in identifying relevant patient populations and therapeutic endpoints owing to a fragmented understanding of disease progression.

### Nuritas

Nuritas claims to have developed a machine learning application that finds and unlocks naturally occurring bioactive peptides from food sources. Peptides are chains of amino acids that potentially provide therapeutic solutions.The company claims that it combines AI and DNA analyses to discover ingredients in different food sources that have therapeutic qualities, including the management of chronic metabolic diseases

*Data Preprocessing*

BioSymetrics

In December 2017, BioSymetrics launched Augusta, a data preprocessing and analytics application which the company claims can analyze and integrate different types of biomedical and healthcare data with existing business processes using machine learning. According to the company, this capability expedites the deployment of AI initiatives in precision medicine, drug discovery, and health data applications.

*Revolution in Pharmaceutical R&D*

World's reputed pharma companies are choosing machine learning to streamline the medicine discovery process. The machines that are skillful at recognizing patterns can look over massive information to solve the complicated biological networks. This, in succession, can aid in the recognition of medicines possibly to work in provided patient populations, while directing pharma companies to avoid the medicines that have the potential to be failed.

*Better Accuracy in Epidemic Prediction*

Machine learning technology is also being used to monitor and forecast epidemic outbreaks throughout the globe, based on information accumulated from the web, social platforms, satellites, and other popular sources. For example, according to research, the "Malaria Outbreak Prediction Model using Machine Learning" acts as an early warning tool to predict the possible outbreaks of malaria,
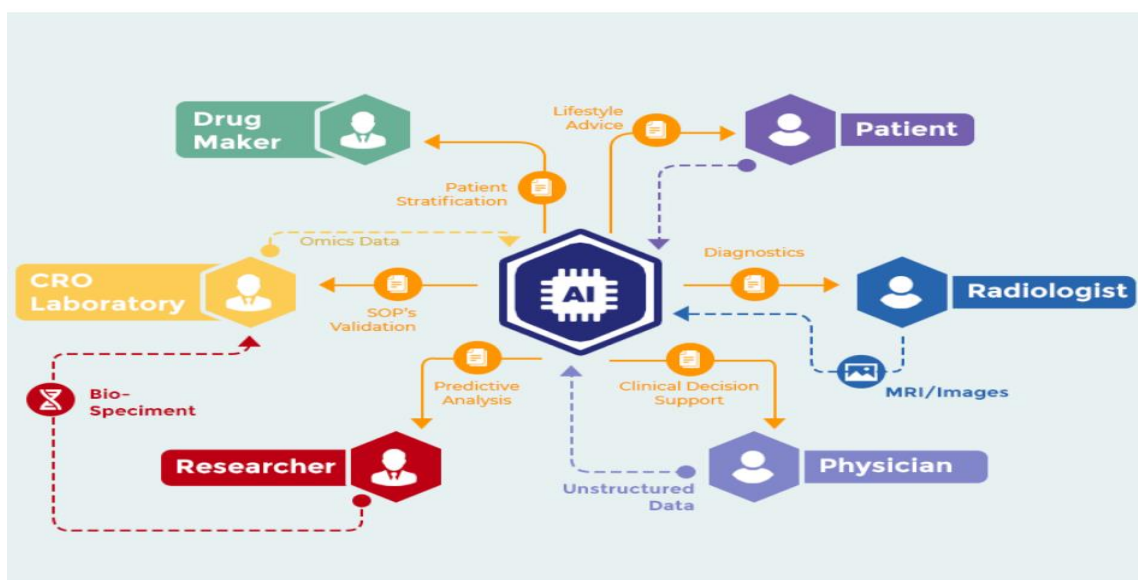


*Conducting Repetitive tasks*

With AI, doing data entry, analyzing medical test reports, and performing other tasks that seem mundane and time0consuming, can be done repetitively in a faster and swifter way. As a result, doctors and additional healthcare providers can have more time to focus on other urgent and complex jobs and interact with patients in a better way.

*Leveraging the Advantages of Natural-language processing*

Being an important component of Artificial Intelligence, natural language processing is the capability of a computer program to comprehend human speech. In the healthcare industry, with natural language processing, a massive amount of electronic medical records can be analyzed. Additionally, the right steps to evaluate and handle patients with multiple diseases can be taken.

*Making Medical Consultation Process Digital*

There are a few AI-based apps that are specially designed to give medical consultation based on the details of a patient's illness symptoms and past medical records. Users can add their symptoms in the app. Then the app can suggest recommended action after going through the user's medical history.

## How Is Artificial Intelegance accelerating drug Discovery

Artificial Intelligence has the potential to transform the drug discovery process. It can make it more efficient and more effective, thus benefiting all parties involved - from companies developing new drugs to patients in desperate need of viable treatments. The health and biotech sector is becoming increasingly rich in data, and these large datasets require advanced analytical methods that can help understand the relationships within the data. However, the lack of advanced technologies limits the drug discovery process, making it a time-consuming and expensive task. Artificial intelligence and machine learning can help address these limits by processing biomedical data to spot patterns of biochemical properties, identify novel interactions of different compounds, and make predictions. For example, AI can extract meaningful information from large datasets, e.g. a dataset of RNA sequencing can be used to identify genes whose expression correlates with a given cellular condition.

AI can be used in many stages of the drug discovery process. Some examples include:

- AI virtual high-throughput screening,
- Predicting target protein structure with AI,
- Predicting bioactivity with AI,
- Toxicity prediction with AI, and more.

## Optimising Artificial Intelligence in The Pharmaceutical Industry

Artificial intelligence can be applied to almost every part of the pharma industry. Christopher Rafter discusses its many uses and how the adoption of machine learning will increase in the future.Artificial intelligence (AI) has wide-reaching potential within the pharmaceutical industry, from clinical trials to marketing and sales analytics. Using a machine learning programme can reduce the time spent on examining data, saving money and allowing researchers to focus on other issues.European Pharmaceutical Review's Victoria Rees spoke with Christopher Rafter, Chief Operating Officer (COO) of Inzata Analytics, to discover more about AI in pharma and its capabilities.
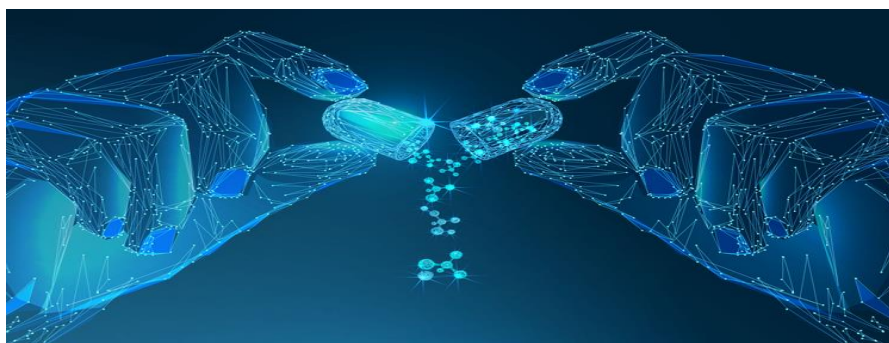


## The Challenges and Opportunities of Using Artificial Intelligence to Manage Chronic Conditions.

the United States, approximately 60% of the adult population is living with one or more chronic condition, from heart disease and asthma through to Alzheimer's, kidney disease, and diabetes.1 This is putting a significant burden on healthcare systems in terms of their ability to deliver care and the cost of managing these illnesses. In the U.S. alone, almost three quarters of healthcare spend is linked to chronic conditions or associated complications.



### *Artificial Intelligence Needs Quality Data*

One of the prerequisites for building an AI platform is the availability of quality data. In short, the cleaner the data, the better the analysis and the better the care. It is therefore important to look at ways to collate, organize, and activate data to make it meaningful so that it can positively impact healthcare

outcomes. The good news is that with increased use of devices and digital tools, the data pools are growing, and as many of these tools monitor more than a single vital statistic, they have the potential to provide a more holistic view of a person's health profile.

*Regulations Need to Evolve*

However, even with comprehensive data, to adopt and optimize AI in healthcare there are many hurdles to overcome. As advances in AI technology progress, governments and authorities are coming together to create legal and regulatory frameworks to ensure its use in a healthcare setting is safe and effective.

*Data Must Be Protected*

The next challenge to tackle involves cybersecurity and data protection. From a patient perspective, while there is increasing appetite to use digital tools to monitor and manage chronic conditions, there is some reluctance to share data with healthcare's wider digital ecosystem.

## Artificial Intelligence Companies Leading the Way in the Pharmaceutical Industry

Artificial intelligence (AI) continues to play a significant role in addressing many of the core challenges currently faced by the pharmaceutical industry. As seen on Pharmaceutical Technology's artificial intelligence deal tracker pharma sector deals involving pharma companies using artificial intelligence over the past nine quarters continues to be led by large corporations in the industry. As well as leading pharma companies using AI for an increasing number of applications and innovations, AI is becoming ubiquitous across society. In the pharma context and beyond, AI has a growing impact on our lives.

The coming years will be more about practical uses of AI, as businesses ensure they get their money's worth by using AI to address specific use cases, not least of which will be seen in the pharma industry.

*Industry investment: pharmaceuticals companies using AI*

Global Data forecasts that the market for AI platforms for the entire healthcare industry will reach $4.3bn by 2024, up from $1.5bn in 2019. This will be driven pharma companies using AI, as well as healthcare providers and payers, with the forecast to reach $2.9bn by 2024.

Leading pharma AI companies have invested time, money and resources in developing their bespoke artificial intelligence solutions. Each solution is designed to disrupt the pharmaceutical industry while simultaneously addressing current difficulties.

*Discover the top pharma AI companies*

In terms of pharma companies using AI, the industry is embracing the benefits it can deliver, especially when used in multiple areas across the entire value chain. *Astra Zeneca, BMS, GSK, Johnson & Johnson*, among others, are all increasingly active in the AI pharma companies' space. Continued investment in the provision of products and services related to artificial intelligence shows no sign of a slowdown.

*Examples of artificial intelligence used in healthcare*

When utilising the wide range of practical applications available, pharma companies using AI have the potential to transform key aspects of the industry while simultaneously driving innovation. Among these uses are data management, remote surgery, diagnostic and procedural AI assistants, drug discovery, and clinical trial design. Global Data experts have estimated, with detailed and data-led forecasts, that the market for AI platforms for the entire healthcare industry will reach $4.3bn by 2024, an increase from $1.5bn in 2019. Such growth will be mainly driven by major, leading pharma companies using AI in a range of applications. Ultimately, the pharma AI industry is forecast to reach $2.9bn by 2024.

*Drug sales*

Using AI in the analysis of vast amounts of clinical data and returning actionable insights, reducing time spent on sales research.

*Smart robotic surgery*

Leading pharmaceutical companies using AI are now Leveraging machine learning capabilities to aid surgeons. This helps with delivering speedy calculations, assessing imagery, and helping with decision making, saving time in critical areas.

*Optimisation of clinical trials*

Assessing clinical trial data, optimisation of patient matching and the design of clinical trials. With many examples of pharmaceutical companies using AI, we can observe real-world applications of the technology. From drug discovery to mental health innovation, real-world applications are having a sizeable impact on both health and company values.

## Takeaways for Business Leaders in the Pharmaceutical Industry

Most of the companies discussed in this report are involved in drug discovery and predicting drug treatment results among patients. Nuritas is focused on finding new and naturally occurring compounds from food sources rather than from synthetic compounds. Most of the companies report that their solutions can be easily integrated into the client's system. However, none of them provided detailed information about how one interacts with their products, and they also aren't transparent about their integration process. As a result, we need to take their claims with a grain of salt.

## TOP 10 Pharmaceutical industries using Artificial Intelligence (AI)

This is forth industrial revolution where AIs have taken over the world. And Pharmaceutical and healthcare sector are most affected industries by AI. Today, we shall see top 10 (2019) highest grossing pharmaceutical companies which are using AI or machine learning for drug discovery, clinical research, disease diagnosis, novel medication, predictions, data analysis etc

### 1. Pfizer

Pfizer promoted a drug discovery partnership with IBM Watson. In December 2016, Pfizer and IBM announced a partnership to accelerate drug discovery in immuno-oncology.In May 2018, Pfizer had fastened AI collaboration. Massachusetts Institute of Technology announced Pfizer as a member of its Machine Learning for Pharmaceutical Discovery and Synthesis Consortium. Pfizer also announced a partnership with Chinese tech startup XtalPi for molecular stability of an organic compound and advanced their work in drug designing.

### 2. Roche

Roche has developed a machine learning diagnostic techniques for diabetic macular edema, a complication of diabetes that causes a thickening of the retina and lead to blindness. Roche can utilise its vast clinical trial database to develop AI algorithms to predict the presence of disease, risk of disease progression, and response to treatment; all of which could be supplied to ophthalmologists to deliver higher quality personalised healthcare.

### 3. Novartis

After becoming CEO of Novartis, Vasant Narasimhan took revolutionary steps towards implementation of Artificial intelligence in Novartis which proven to be global footprints for others.Novartis was able to decode cancer pathology images through AI. Novartis joined with Tech startup PathAI and created a system through which they are able to diagnose cancer.

### 4. Johnson & Johnson

Johnson & Johnson announced results of a new real-world study, which found newly diagnosed patients with nonvalvular atrial fibrillation (NVAF) taking XARELTO® (rivaroxaban) experienced significantly fewer strokes, significantly fewer severe strokes and fewer stroke-related deaths compared to those taking warfarin using artificial intelligence. The study also found that XARELTO® significantly reduced overall strokes (across all severities) by 18 percent compared to warfarin and reduced the risk of experiencing the most severe strokes.

### 5. MSD (Merck & Co., Inc., Kenilworth, N.J., USA)

Merck and Wayra UK are working together (part of Spanish telecoms business Telefonica) under the banner of the 'Velocity Health' programme. The Velocity Health programmes focused on prevention in healthcare with an emphasis on diabetes prevention and cancer prevention.

### 6. Sanofi

Sanofi Genzyme, the specialty care global business unit of Sanofi joined with Recursion Pharmaceuticals to deploy its drug repurposing platform to identify new uses for Sanofi's clinical stage molecules across dozens of genetic diseases.

### 7. Abbvie

Abbvie is working with AI very silently. But it does have a confidential project listed with Atomwise.In September 2016, AbbVie partnered with AiCure to use AI-based patient monitoring platform improved adherence in an AbbVie phase 2 schizophrenia trial.

### 8. GlaxoSmithKline (GSK)

GSK is very active to utilize artificial intelligence for drug disvocery and they have created an in-house artificial intelligence unit. Initially it was called "Medicines Discovered Using Artificial Intelligence." And then renamed as "In silico Drug Discovery Unit." As of July2019, GSK's AI team reportedly numbered about 50.

### 9. *Amgen*

Amgen is an investor in precision medicine startup GNS Healthcare.
In May 2018, MIT announced that Amgen was a member of its Machine Learning for Pharmaceutical Discovery and Synthesis Consortium. Amgen is also working with medical research machine learning startup Owkin.

### 10. *Gilead Sciences*

Gilead's first publicly announced use of AI in drug discovery was in April 2019. This month, Gilead announced a strategic collaboration with stealthy startup Insitro. The collaboration will focus on nonalcoholic steatohepatitis (NASH).

## AI Jobs Insights in the Pharma Sector

Pharmaceutical Technology monitors live pharma company jobs postings mentioning artificial intelligence or those requiring similar technology skills AI Job Trends in the Pharma Sector Jobs postings by pharmaceutical companies mentioning artificial intelligence over the recent past. AI jobs tracker in the pharma sector looks at jobs posted, closed and active in the sector.

### Most Active Pharma Companies with AI Jobs

Pharmaceutical Technology's pharma jobs tracker lists pharmaceutical companies with most artificial intelligence jobs posted in the recent past.
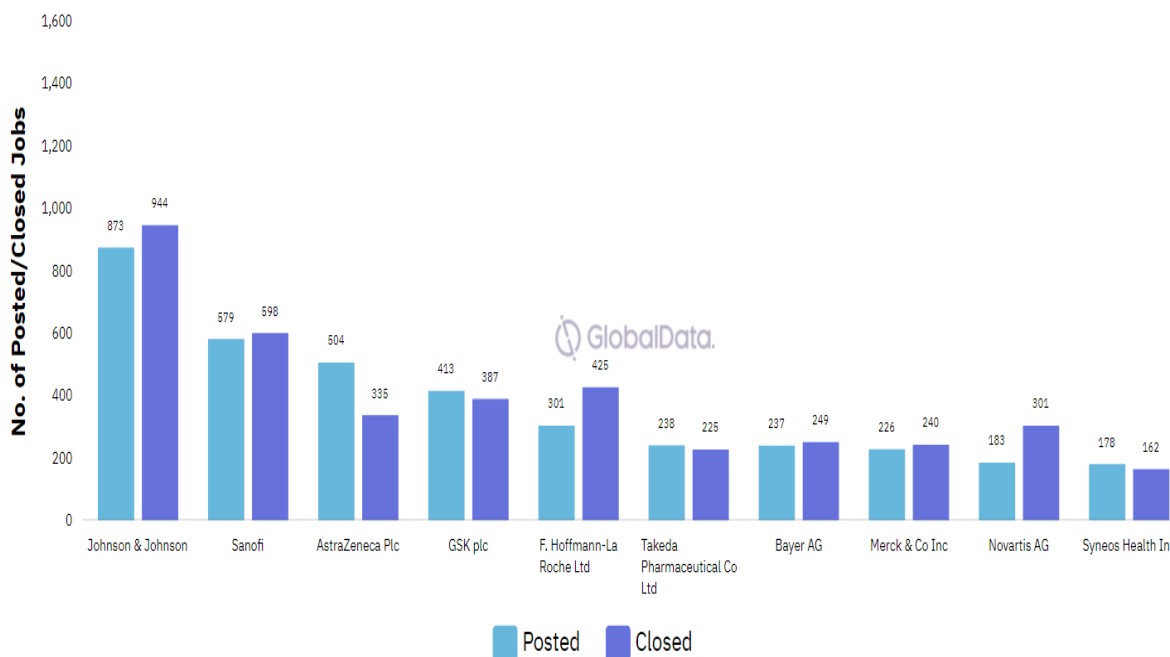


## AI Driven Innovation in the Pharma Sector

To best track the emergence and use of artificial intelligence in pharma, Pharmaceutical Technology tracks patents filings and grants as well as companies that hold most patents in the field of artificial intelligence Number of patents in AI in the Pharma Sector: Past 20 years.
Artificial intelligence patents tracker in the pharma sector monitors the patents filings and grants over the past two decades

Source: **GlobalData Patent Analytics**
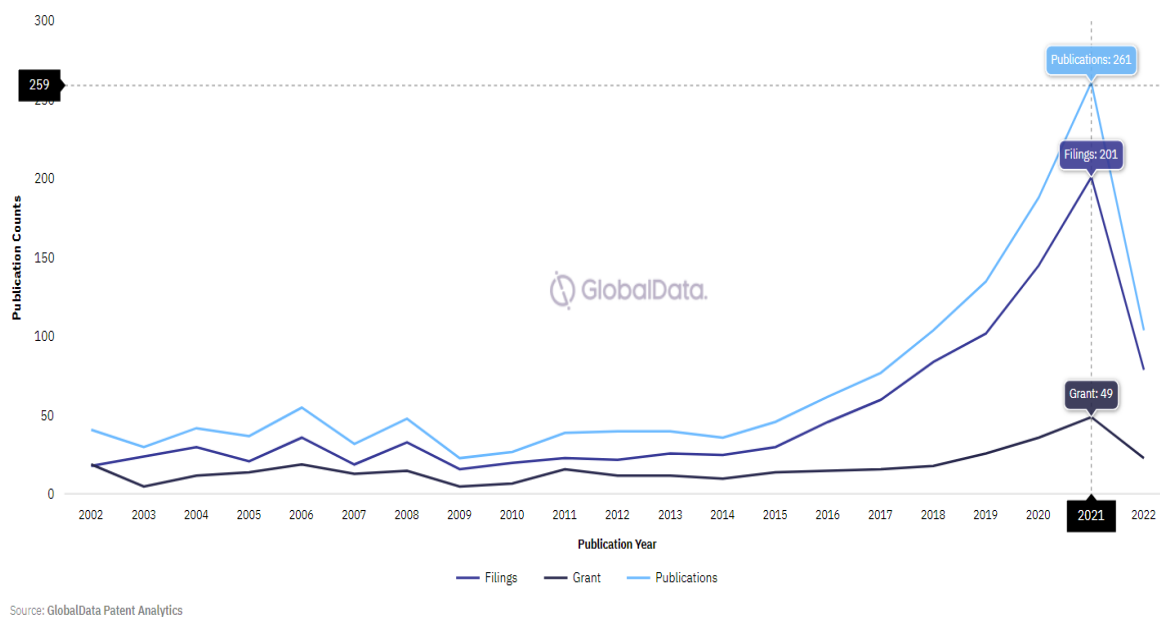
## Impact of Artificial Intelligence in the Pharmaceutical industry: How is AI transforming the pharmaceutical industry?

The pharmaceutical industry has long relied on cutting-edge tools and technologies to help deliver safe, reliable drugs to market. With the recent pandemic, on the surface, although it may seem that the challenge faced by the pharmaceutical industry is just about the race against time to find a viable vaccine, it is the digital technologies and tools that helped them achieve this historical victory. This is where Artificial intelligence in the pharmaceutical industry has been playing a critical role. Over the last five years, the use of Artificial Intelligence in the pharmaceutical industry has redefined how scientists develop new drugs, tackle the disease, and more. According to a report by verdict, 70% of the businesses surveyed thought that AI would be very important for their growth and survival. For pharmaceutical businesses that thrive on innovation, this is a crucial statistic to understand. Here is how AI and ML are transforming the pharmaceutical industry.



## Artificial Intelligence & the Pharma Industry: What's Next

Artificial intelligence in Pharma refers to the use of automated algorithms to perform tasks which traditionally rely on human intelligence. Over the last five years, the use of artificial intelligence in the pharma and biotech industry has redefined how scientists develop new drugs, tackle disease, and more.

## Artificial Intelligence Could Be the Key to Longevity:

What if we could generate novel molecules to target any disease, overnight, ready for clinical trials? Imagine leveraging machine learning to accomplish with 50 people what the pharmaceutical industry can barely do with an army of 5,000. It's a multibillion-dollar opportunity that can help billions. The worldwide pharmaceutical market, one of the slowest monolithic industries to adapt, surpassed $1.1 trillion in 2016. In 2018, the top 10 pharmaceutical companies alone are projected to generate over $355 billion in revenue. At the same time, it currently costs more than $2.5 billion (sometimes up to $12 billion) and takes over 10 years to bring a new drug to market. Nine out of 10 drugs entering Phase I clinical trials will never reach patients. As the population ages, we don't have time to rely on this slow, costly production rate. Some 12 percent of the world population will be 65 or older by 2030, and "diseases of aging" like Alzheimer's will pose increasingly greater challenges to society. But a world of pharmaceutical abundance is already emerging. As artificial intelligence converges with massive datasets in everything from gene expression to blood tests, novel drug discovery is about to get more than 100 times cheaper, faster, and more intelligently targeted.
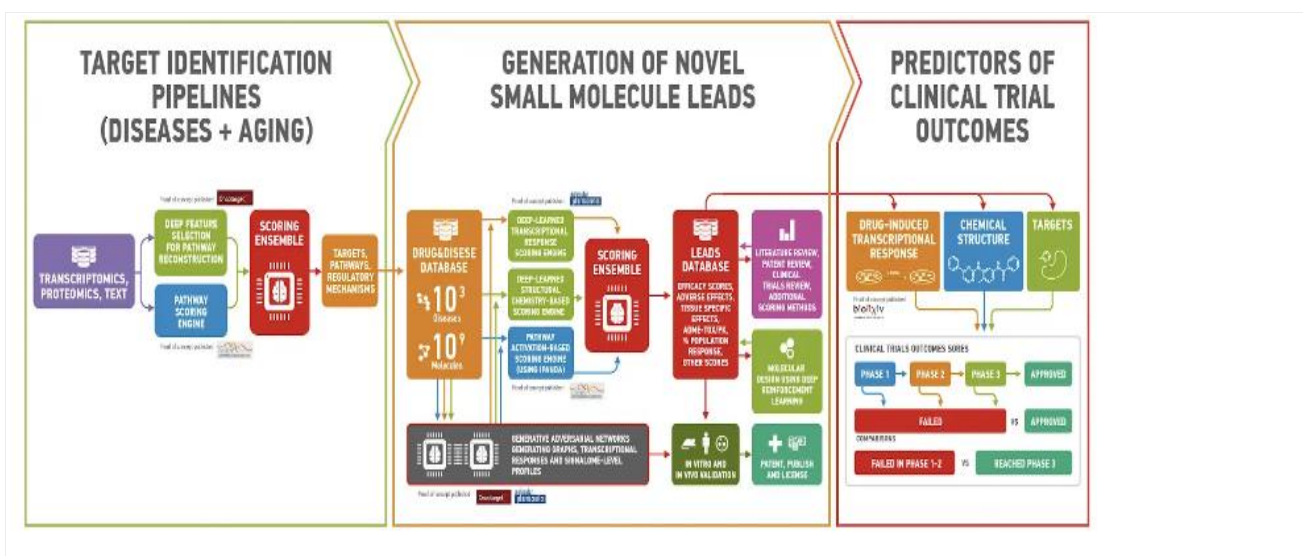


### CASE STUDY: LEVERAGING AI FOR DRUG DISCOVERY

You've likely heard of deep neural nets -- multilayered networks of artificial neurons, able to 'learn' from massive amounts of data and essentially program themselves. Build upon deep neural nets, and you get generative adversarial networks (GANs), the revolutionary technology that underpins Insilico's drug discovery pipeline.

### IN SILICO'S END TO ED PIPELINE

First, Insilico leverages AI -- in the form of GANs -- to identify targets (as seen in the first stage of their pipeline below). To do this, Insilico uses gene expression data from both healthy tissue samples and those affected by disease. (Targets are the cellular or molecular structures involved in a given pathology that drugs are intended to act on.)

### THE 6 D'S OF DRUG DISCOVERY

The digitization and dematerialization of drug discovery has already happened. Thanks to converging breakthroughs in machine learning, drug discovery and molecular biology, companies like Insilico can now do with 50 people what the pharmaceutical industry can barely do with an army of 5,000. As

computing power improves, we'll be able to bring novel therapies to market at lightning speeds, at much lower cost, and with no requirement for massive infrastructure and investments.

## AI for Pharmaceutical Market Analysis 2022 In-depth Research Studies on Products, Countries, Companies and Industry Segmentation by 2030
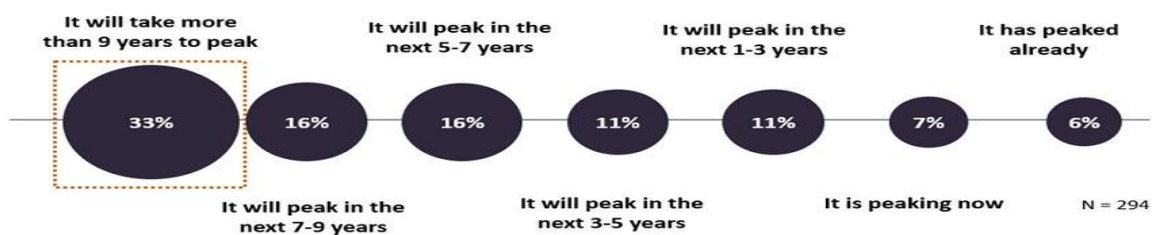
In 2019, the global artificial intelligence market in medicines was estimated at $XXXX billion and is anticipated to hit $XXXX billion from 2020 to 2030 at a CAGR of 49.8%.. The global AI for Pharmaceutical market is expected to grow significantly in the future, owing to rising demand for the product, increased awareness of the product, and major expenditures to improve product efficiency and close the demand-supply gap in the market.

According to Fatpos Global, the major components are "AI for Pharmaceutical Market Insights, Size, Opportunities, Share, Growth, Emerging Trends, Forecast to 2031." The report includes a variety of in-depth research studies on various aspects of the global AI for Pharmaceutical market. It's a praiseworthy effort to give a true, transparent picture of the current and future state of the global AI for Pharmaceutical market, based on trustworthy data and extremely exact figures. The publication then goes on to provide an in-depth analysis of regional markets based on current trends, overall performance, and profitable potential. Finally, the domain's competitive environment is thoroughly explored to aid in a clear understanding of important competitors, their business profiles, product and service portfolios, and expansion strategies.

## It will take years for AI use to peak in drug discovery and development process

Drug discovery and development is a time-consuming, extremely expensive and high-risk process. The research and development (R&D) for a new drug may take 12–18 years with an average cost of $1–3bn. The high attrition rate is one of the biggest challenges associated with the drug discovery and development process—thousands of compounds are subject to early preclinical testing, but only a handful of viable candidates eventually move from clinical trials to commercialisation. Most pharma companies are now focusing on leveraging technologies such as artificial intelligence (AI) to improve the odds of drug discovery and development success.



Figure 1: Time Needed for the Use of AI to Peak in Drug Discovery and Development Process

## Filings buzz in pharma: 60% increase in AI mentions in Q4 of 2021

When pharmaceutical companies publish annual and quarterly reports, ESG reports and other filings, GlobalData analyses the text and identifies individual sentences that relate to disruptive forces facing companies in the coming years. Artificial intelligence is one of these topics - companies that excel and invest in these areas are thought to be better prepared for the future business landscape and better equipped to survive unforeseen challenges.To assess whether artificial intelligence is featuring more in the summaries and strategies of pharmaceutical companies, two measures were calculated. Firstly, we looked at the percentage of companies which have mentioned artificial intelligence at least once in filings during the past twelve months - this was 36% compared to 16% in 2016. Secondly, we calculated the percentage of

**Artificial intelligence mentions have increased 329% since 2016**

% of all sentences in the filings of companies in the pharmaceutical industry which refer to artificial intelligence, by quarter

Source: GlobalData

CLINICAL TRIALS ARENA

## Global Artificial Intelligence (AI) in Drug Discovery Market ($4197.5 Mn by 2028)

The Global Artificial Intelligence in Drug Discovery Market size is expected to reach USD 4,197.5 Million by 2028, exhibiting a Compound Annual Growth Rate (CAGR) of 41.5% during the forecast period. The drug discovery is an initial step in process of novel drug candidate's identification and its therapeutic target. Artificial intelligence has been continuously used in healthcare industry, mainly for finding new drugs. AI plays a vital role in the discovery, design, and screening of molecules in short span of time. The growth of AI in drug discovery is mainly driven by increasing number of cross industry collaborations as well as partnerships coupled with requirement for controlling the drug discovery & development costs and time which is taken in the process, states Vantage Market Research, in a report, titled "Artificial Intelligence in Drug Discovery Market by Application (Drug Optimization and Repurposing, Preclinical Testing, Others), by Therapeutic Look (Oncology, Neurodegenerative Diseases, Cardiovascular Disease, Metabolic Diseases), by Region (North America, Latin America, Europe, Asia Pacific) - Global Industry Assessment (2016 - 2021) & Forecast (2022 - 2028)". The market size valued at USD 627.1 Million in 2021.

## Artificial Intelligence in Healthcare Market Size 2022-2030 |

The global artificial intelligence in healthcare market is expected to reach a market size of USD 215.53 Billion by 2030 and register a substantially high CAGR over the forecast period, according to a new report by Reports and Data. Artificial intelligence (AI) in healthcare market revenue growth is driven by increasing efficiency in drug discovery and advancement in precision medicine, which is resulting in rising demand and application of these solutions globally. Rise in prevalence of chronic diseases, and increasing global elderly population is expected to continue to support the growth of the market.

## The Future of AI in the Pharmaceutical Industry

Artificial Intelligence plays an important role in the pharmaceutical industry and the coming years there is simply no sign of the adoption of this cutting-edge technology slowing down. From making healthcare process automated to help in drug discovery, AI with machine learning can bring revolution in this industry. More companies should start adopting this technology to make R&D approaches and patient care better.
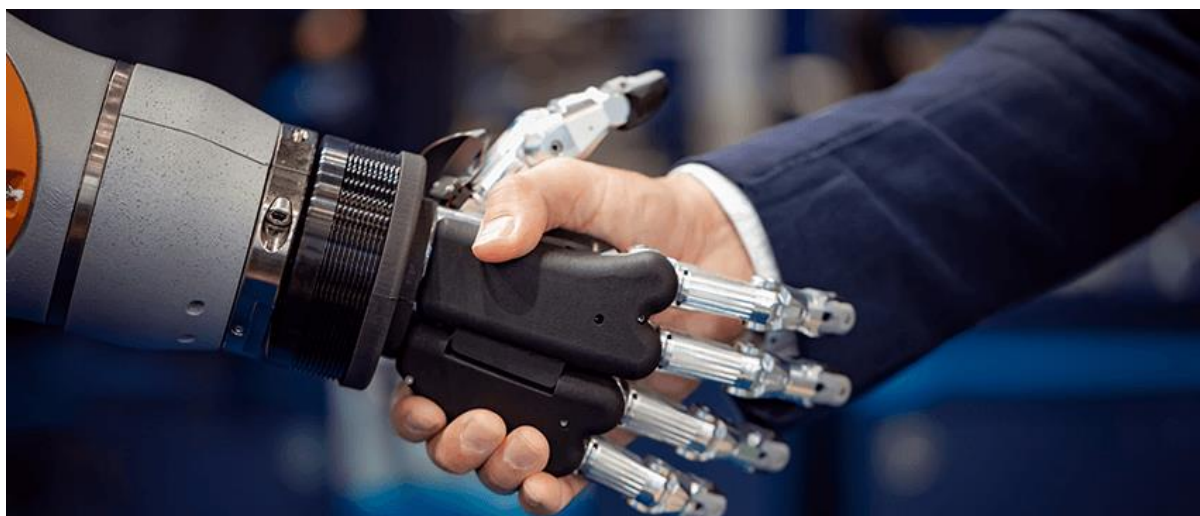
## Wrapping it up,

There is simply no limit on how well Artificial Intelligence with its important components can revolutionize the pharmaceutical and healthcare industry. With a promising future, Artificial Intelligence is here to rule. So, if you want to explore new opportunities to discover drugs, make the treatment procedures more effective, keep the R&D process organized while reducing risks and saving cost, embrace AI.

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