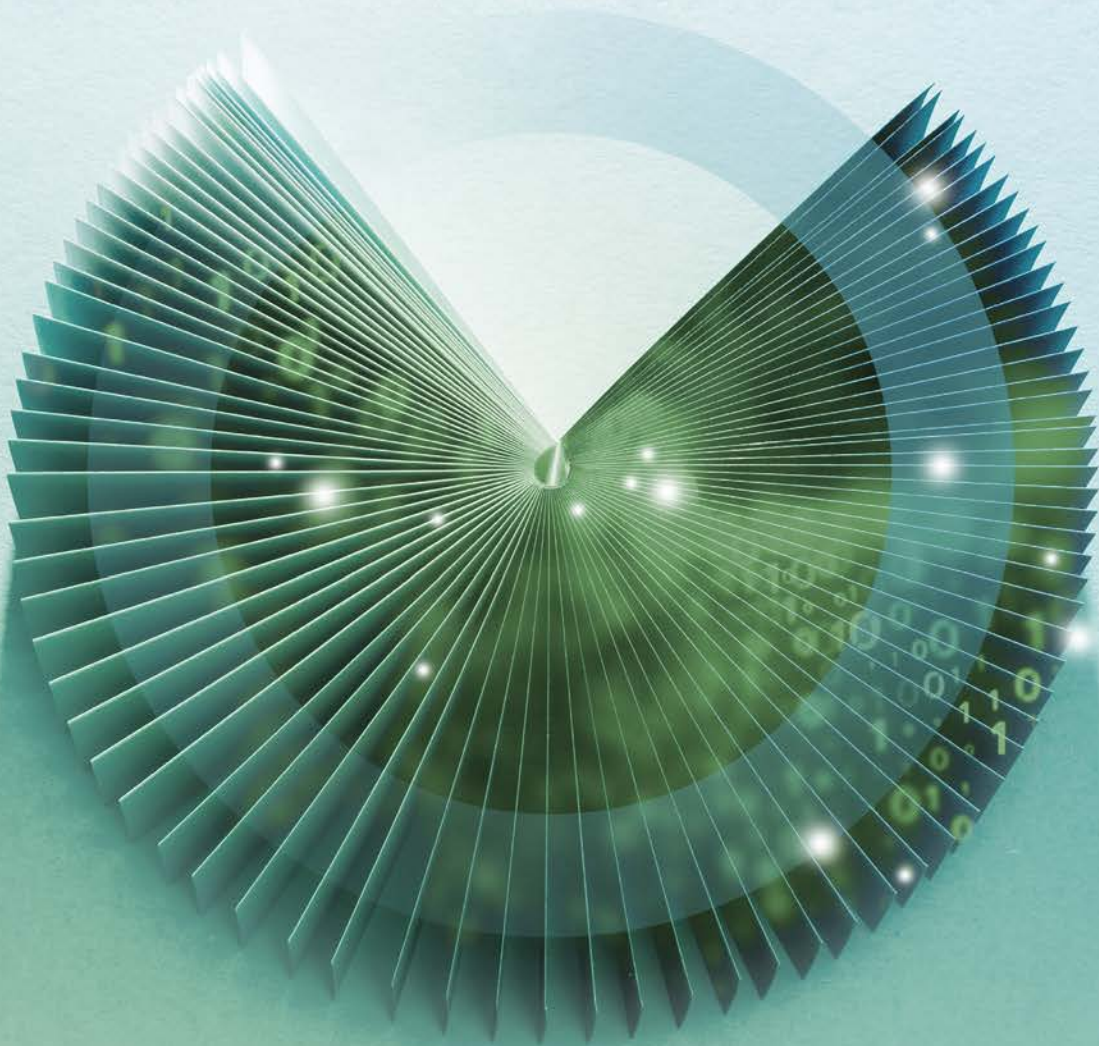**Deloitte.**

The Life Sciences
& Health Care AI Dossier

By Deloitte AI Institute

What's inside

About the Deloitte AI Institute
The Deloitte AI Institute helps organizations connect all the different dimensions of the robust, highly dynamic and rapidly evolving AI ecosystem. The AI Institute leads conversations on applied AI innovation across industries, with cutting-edge insights, to promote human-machine collaboration in the "Age of With."

The Deloitte AI Institute aims to promote the dialogue and development of artificial intelligence, stimulate innovation, and examine challenges to AI implementation and ways to address them. The AI Institute collaborates with an ecosystem composed of academic research groups, start-ups, entrepreneurs, innovators, mature AI product leaders, and AI visionaries, to explore key areas of artificial intelligence including risks, policies, ethics, future of work and talent, and applied AI use cases. Combined with Deloitte's deep knowledge and experience in artificial intelligence applications, the Institute helps make sense of this complex ecosystem, and as a result, deliver impactful perspectives to help organizations succeed by making informed AI decisions.

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After decades as science fiction fantasy, artificial intelligence (AI) has made the leap to practical reality and is quickly becoming a competitive necessity.

Introduction

After decades as science fiction fantasy, artificial intelligence (AI) has made the leap to practical reality and is quickly becoming a competitive necessity. Yet, amidst the current frenzy of AI advancement and adoption, many leaders and decisionmakers still have significant questions about what AI can actually do for their businesses.

This dossier highlights several of the most compelling, business-ready use cases for AI in Life Sciences & Health Care. Each use case features a summary of the key business issues and opportunities, how AI can help, and the benefits that are likely to be achieved. The dossier also includes several emerging AI use cases that are expected to have a major impact on the industry in the future.

Of course, the best uses for AI vary from one organization to the next, and there many compelling use cases for AI beyond the ones highlighted here. However, reading through this collection should give you a much clearer sense of what AI is capable of achieving in a business context—now, and over the next several years—so you can make smart decisions about when, where, and how to deploy AI within your own organization (and how much time, money, and attention you should be investing in it today).

Nitin Mittal
US AI Co-Leader
Deloitte Consulting LLP

Irfan Saif
US AI Co-Leader
Deloitte Risk & Financial Advisory

Six ways that AI creates business value

Looking across all AI use cases, there are generally six major ways that AI can create value for a business:[1]

Cost reduction
Applying AI and intelligent automation solutions to automate tasks that are relatively low value and often repetitive, can reduce costs through improved efficiency and quality.

Example
Automating data entry and patient appointment scheduling using natural language processing.

Speed to execution
Reducing the time required to achieve operational and business results by minimizing latency.

Example
Accelerating the process of drug approval by using predictive insights to create a synthetic trial.

Reduced complexity
Improving understanding and decision making through analytics that are more proactive, predictive, and able to see patterns in increasingly complex sources.

Example
Reducing factory downtime by predicting machinery maintenance needs.

Transformed engagement
Changing the way people interact with technology, enabling businesses to engage with people on human terms rather than forcing humans to engage on machine terms.

Example
Using conversational bots that can understand and respond to customer sentiment to address customer needs more effectively.

Fueled innovation
Redefining where to play and how to win by using AI to enable innovative new products, markets, and business models.

Example
Recommending new product concepts and features based on customer needs and preferences mined from social media.

Fortified trust
Securing a business from risks such as fraud and cyber—improving quality and consistency while enabling greater transparency to enhance brand trust.

Example
Identifying and anticipating cyber attacks before they occur.

Top use cases in Life Sciences & Health Care

To date, most organizations in life sciences & health care (LSHC) have only scratched the surface of AI's potential—primarily using it to automate repetitive tasks and standard business processes. However, AI is now widely recognized as a strategic business issue in this area and is actively being discussed at the board and C-suite levels.

By combining AI technology with the fields of medicine and science, organizations are looking for opportunities to transform some of their most critical processes and achieve sustainable competitive advantage through AI. In particular, AI has the potential to expedite drug development—helping researchers to identify and validate genetic targets, and to design novel compounds. AI also has the potential to help companies launch and market products more effectively, and to make supply chains smarter and more responsive.

According to a recent Deloitte survey about the use of AI in life sciences globally:[2]

- More than 60 percent of life sciences companies surveyed spent in excess of US $20 million on AI initiatives in 2019, and more than 50 percent of respondents expected their investments in AI to increase in 2020.

- The top outcomes that surveyed life sciences companies are striving to achieve with AI include: enhancing existing products (28%); creating new products and services (27%); and making processes more efficient (22%).

- Top challenges of respondents facing AI initiatives include: difficulty in identifying business cases with the highest value (30%); data challenges (28%); and integrating AI into the organization (28%).

AI is already proving its value in making processes more efficient, with 43 percent of the surveyed organizations reporting success in that area. And over the next three to five years, AI is expected to have a transformational impact on biopharma research and development (R&D), particularly for drug discovery. Meanwhile, life sciences companies will likely continue to conduct AI pilots and proofs-of-concept in many other parts of the value chain.

In health care, AI adoption is still largely in its infancy. However, it is quickly gaining traction—and ultimately AI is expected to have a huge transformational impact on the business of health care—and on how health care is delivered. Today, most early use cases for AI in health care focus on administrative tasks and basic automation, rather than more sophisticated clinical applications such as disease diagnosis and care delivery, which seem riskier and require higher levels of intelligence.

However, more advanced AI applications are already emerging that demonstrate the practical viability of sophisticated clinical use cases (e.g., the use of AI for imaging diagnoses).

The main focus for AI in health care over the next several years should be on elevating and personalizing every aspect of the patient experience—from call center interactions and claim administration to care delivery and follow up. Patient-related activities that could greatly benefit from AI run the gamut from getting patients registered more quickly and making their visits more personalized and efficient, to using AI to create and execute truly individualized treatment plans based on a complex mix of datasets (including a patient's health history, lifestyle, genomic make-up, and personal preferences). This focus on the patient experience could create significant value for patients and providers alike, while setting the stage for longer-term use of AI in the most sophisticated clinical applications.

As AI becomes a standard business tool—and competitive necessity—organizations in Life Sciences & Health Care will need a clear vision and strategy for harnessing the power of AI. They will also need the building blocks in place to develop and deploy AI solutions at scale. These building blocks include: the right IT infrastructure; the right talent and skill sets; and alliances/ecosystems that enable them to develop or access the AI capabilities they need.

For most organizations, the single most important AI building block is data: getting access to the rich data that AI systems require, and then managing that data in a coordinated way across the enterprise. With robust data, the potential use cases for AI in life sciences & health care are nearly limitless.

Trials with less error
(Digital Data Flow for Clinical Trials)

Use cognitive automation to integrate trial data from multiple systems, populate standardized digital data elements, and generate trial artifacts such as case report forms and study reports.

Issue/Opportunity
There is no shortage of data associated with clinical trials. However, the traditional flow of data across the clinical trial lifecycle can quickly become a complicated maze marked by manual effort, rework, and inefficiency—leaving researchers feeling like they're working in 2003, not 2021.

How AI can help

- *Automate data management for clinical trials.* Use AI to streamline data gathering and artifact creation tasks so clinical site investigators can focus on value-added services like patient engagement. Automate data management across the lifecycle by creating structured, standardized, digital data elements. Then use AI to intelligently interpret data elements and feed downstream systems and auto-populate required reports and analyses.

- *Create a single source of the truth.* Accelerate clinical trials and improve decision-making by establishing an interoperable, intelligent, single source of the truth.

- *Use AI insights to improve the next trial.* Foster continuous improvement by generating insights from past and current trials that can be used to inform and improve future trials.

Possible benefits

Faster trials at lower cost.
The costs and time required to execute a clinical trial through smart automation and improved efficiency, with less need for rework can be significantly reduced.

Reusable data.
The need to re-build databases across trials by using AI technologies to intelligently reuse existing data based on standardized data elements can be avoided.

Accelerated speed to market.
By reducing the time and effort required for clinical trials, AI-enabled data management can accelerate the drug approval process and help companies get new drugs to market more quickly.

Smarter drug manufacturing
(Drug Manufacturing Intelligence)

Use algorithmic models and sensor data to maximize factory yield and productivity by predicting manufacturing deviations and pro-actively suggesting corrective actions.

Issue/Opportunity
Fixing manufacturing issues today requires laborious manual intervention to access multiple systems, with action taken only after problems occur. Applying AI to manufacturing data can help predict process bottlenecks, identify quality control issues, and pro-actively suggest corrective actions.

How AI can help

- *Analyze large volumes of data from multiple systems.* Biopharma manufacturing data is often scattered across internal and external systems that lack interoperability and consistency. AI-based algorithms can process extensive amounts of data from disparate systems, intelligently and contextually aggregating, analyzing, and rapidly learning from plant floor, environmental, product, and quality release testing data.

- *Proactively improve manufacturing performance.* AI-driven simulations and modeling can assess various parameters during the manufacturing process and recommend actions that: improve yield and output; address quality issues; and release free capacity through suggested and autonomously performed mitigation actions.

Possible benefits

Reduced manufacturing deviations and improved product quality.
AI technologies can improve product quality by minimizing variations during the manufacturing process.

Higher yield.
Pro-actively addressing process bottlenecks and production deviations can lead to higher output and yield.

Changing channels
(Drug Marketing Omnichannel Engagement)

Use machine learning models to predict the best ways to engage with patients and health care professionals (HCPs)—and to optimize marketing spend across media channels.

Issue/Opportunity

As customer preferences evolve and competition among drug manufacturers heats up, brand engagement is becoming more important than ever. Yet many companies still struggle to answer the critical questions that drive ROI on their digital marketing investments: Which channels should I invest in? Who should I engage with? And what content is right for them?

How AI can help

- *Predict the best ways to engage with patients and HCPs.* Use machine learning models based on promotional and longitudinal data to predict how, when, and with what message type to best engage with patients and HCPs.

- *Optimize marketing spend across channels.* Generate channel spend recommendations to drive campaign ROI, using performance and payback as metrics to inform future budgets.

- *Personalize cross-channel engagement.* Analyze target personas and predict behavioral responses across various channel-content combinations. Develop customized content that is relevant, authentic, and based on a holistic view of the patient or HCP. Align timely marketing messages and behavioral nudges across the customer journey.

Possible benefits

Increased marketing ROI.
AI technologies can increase the efficiency and effectiveness of a company's marketing spend.

Improved customer engagement.
Predictive AI and machine learning enable companies to anticipate each customer's needs and deliver a consistent experience across all channels.

Higher customer conversation rates.
By understanding and anticipating the needs of patients and HCPs, AI can help spur them into action.

Active listening
(Voice of the Patient Insight)

Use AI to analyze patients' and HCPs' social media feedback, complaints, and adverse events—generating insights that can improve product design, packaging, and educational materials.

Issue/Opportunity

With the rise of social media and other online forums, life sciences companies have a prime opportunity to tap into patient and HCP narratives—such as complaints, medical inquiries, and social media posts—to derive product intelligence and improve product development. Deeper insight about customer needs and concerns can inform product development and messaging—helping to ensure patients understand the products available to them, and that they receive optimal care.

How AI can help

- *Enable data-driven decision making.* Use AI technologies and insights to transform decision making from "we think" to "we know."

- *Gather and analyze data from multiple sources.* Intelligently mine product information from various sources to capture the Voice of the Patient (and Voice of the HCP).

- *Generate actionable recommendations and insights.* Create actionable insights that can augment decision-making across the value chain and improve product intelligence.

- *Transform product development.* Fundamentally change how the next iteration of products is developed.

Possible benefits

Increased customer satisfaction (with fewer complaints).
By deepening a company's understanding of customer needs and concerns, AI can improve satisfaction and reduce the need for customers to vent their frustrations online.

Improved product design and engineering.
The insights derived from intelligently mining social media and other customer data sources can help companies design better products.

Compliance amidst complexity
(Proactive Risk and Compliance)

Use AI to automate the analysis and aggregation of data when identifying risk and compliance issues—recommending the next best action and possible mitigation methods.

Issue/Opportunity

The life sciences industry is subject to a high level of government regulation, both locally and globally. Such regulation is important to ensure—among other things—that products and treatments are safe and effective, and that pricing and contracting are executed in a compliant manner. However, achieving compliance with the global industry's complex mix of regulations can be difficult and costly.

Ineffective compliance processes in life sciences can delay product development, creating a negative impact for everyone involved—including manufacturers, HCPs, and patients. As such, failure to address risk management and compliance issues is not an option.

How AI can help

• *Analyze the impact of policy changes in real time.* Using natural language processing, policy changes can be analyzed for impact in real time, with AI and machine learning applications identifying what information matters, why it matters, and who it matters to most.

• *Enable real-time risk assessments and compliance monitoring.* Robotic process automation, AI, and machine learning can enable real-time risk assessments and real-time auditing/monitoring of regulatory compliance, providing immediate notifications and information about detected issues.

• *Conduct sophisticated, multi-source analysis of compliance risk areas.* AI-enabled data analysis can identify critical areas of compliance risk—such as fraud, kickbacks, and off-label discussions—and then highlight potential techniques and actions for mitigation.

Possible benefits

Lower compliance costs.
A simpler, faster way to manage global compliance requirements can save time, money, and resources.

Fewer errors.
AI-enabled compliance can reduce the human element, minimizing compliance errors and related consequences such as regulatory fines and reputation damage.

More agile compliance processes.
Changes to AI-based compliance processes can be implemented at the push of a button, instead of requiring extensive communication and retraining for human operators.

360° engagement
(Patient Engagement)

Use AI to improve every aspect of patient engagement, from scheduling appointments and accessing medical records to communicating with health care staff and care coordination teams.

Issue/Opportunity

Patients today often face significant challenges when trying to access, understand, and manage their care. Many patients struggle to book appointments, access medical records, determine which services are available to them, and get answers to simple logistical questions. This can cause them to become disengaged and can impair their ability to make fully-informed decisions about their health care.

How AI can help

• *Make complex medical information easier for patients to understand.* Natural language processing can parse complicated medical information/data into meaningful insights for patients—and then communicate those insights to them, increasing their health literacy.

• *Streamline communication between health care workers by filtering out extraneous information.* AI and machine learning solutions can improve internal communication between health care workers by enabling systems to collect and share relevant information only with those who need it.

• *Accelerate and improve database searches.* AI-enabled databases can execute queries faster and more accurately, reducing the time required to find information and improving database reliability.

• *Make chatbots smarter.* Natural language processing and machine learning can train chatbots to perform better on a wide range of tasks, such as addressing patient questions, scheduling appointments and calls, and referring patients to other departments. Chatbots and call automation can also be used for outpatient follow-ups and check-ins.

• *Create and execute personalized plans for engaging with patients.* Prescriptive analytics can suggest personalized next best actions for patients, with appropriate "nudging" and other tailored engagement activities.

Possible benefits

Increased focus on care delivery, not administration.
As administrative tasks become more automated, staff can spend more time on improving and delivering patient care.

Reduced processing costs and fewer errors.
Automated systems are less likely to make mistakes or function inconsistently, reducing errors and costs.

Improved patient engagement and better health care decisions.
As the health care system becomes easier to navigate and understand, consumers can be better equipped to make informed decisions.

Better understanding of patient needs.
AI-enabled patient engagement can improve providers' understanding of patient needs by seamlessly connecting all available patient information.

More diligent treatment of chronic conditions.
Virtual assistants enable ongoing contact that can help patients with chronic conditions stay engaged and active in their health care plans.

Next-level claims handling
(Health Care Revenue Cycle Optimization and Efficiency)

Use AI to automate claims submission and payment for pre-care, day-of-care, and post-care activities.

Issue/Opportunity
Medical claims management is a time-consuming and resource-intensive process that can extend or delay pre-care, day-of-care, and post-care activities. Health care providers spend vast resources standardizing, validating, and corroborating millions of claims per year—in some cases relying on third-party vendors to manually review claims and input data into files for claim validation. This process is often expensive, slow, and prone to errors.

How AI can help

- *Automate claims data extraction and input.* Robotic process automation tools can intelligently extract information from large quantities of structured and unstructured data without manual involvement.

- *Provide real-time status updates and monitoring.* An automated system can provide real-time status updates, summary information, and claims monitoring.

- *Automate follow-ups and denials.* Repeatable tasks related to claims, follow-ups, and denials can be carried out instantly by RPA tools, without manual processing and control.

- *Analyze filed claims in real time.* AI-enabled data analysis can provide real-time insights on filed claims.

Possible benefits

Faster. Cheaper. More accurate.
AI-enabled solutions can process claims more quickly and accurately than can humans (such as claims representatives and revenue analysts), saving time and resources for providers and patients alike.

More agile.
Claim and denial processes can be changed with little or no retraining of staff.

Next-level diagnosis
(Computer Assisted Diagnosis)

Use AI technologies to diagnose medical conditions more efficiently and accurately.

Issue/Opportunity
Diagnosing medical conditions is a difficult and complex task that hinges on a wide variety of factors—including not just a patient's current symptoms and test results, but also numerous other factors such as genetic background, lifestyle, and detailed medical history—much of which is not readily available to human medical practitioners using traditional systems and processes.

How AI can help

- *Analyze vast quantities of medical data.* AI can analyze vast amounts of medical data from a wide range of sources and then connect the dots, uncovering complex patterns and disease characteristics that humans might not be looking for.

- *Provide recommendations to medical practitioners.* Through focused application of AI technologies such as deep neural networks, machine learning, and categorization, medical practitioners can rely on AI for more accurate and efficient analysis of patient data.

Possible benefits

Improved accuracy and lower costs.
AI can help automate the diagnostic process, improving accuracy while potentially reducing operational costs.

Improved efficiency so medical practitioners can spend more time with patients.
AI and machine learning can help with diagnosis to improve efficiency, giving medical practitioners more time to focus on activities such as patient interaction and support.

Medicine that is truly personal
(Precision Medicine & Personalized Health)

Use predictive insights to proactively diagnose, prevent, and treat a future illness based on an individual's lifestyle, real-world environment, biometric data, and genomics.

Issue/Opportunity
Precision medicine (taking into account an individual's genetics, environment, history, and lifestyle when considering medical options) has emerged as an effective and cost-efficient form of disease treatment and prevention. The increasing availability and quantity of medical data—both an individual's data, as well as anonymized historical medical data—is enabling medical practitioners to be more precise in addressing a patient's needs and assigning treatments specifically suited to that individual.

How AI can help

- *Find connections across multiple datasets.* Machine learning algorithms can link treatment outcomes to a variety of health datasets (such as patient data, medical literature, lifestyle information, genetic makeup, and medical history), providing detailed insights and predictions for health care professionals to act on.

- *Quickly collect and analyze vast amounts of data.* With AI and machine learning capabilities, life sciences companies can collect, store, and analyze large datasets far more effectively than through manual processes. This enables them to conduct research more quickly—based on data about genetic variations from a huge number of patients— and to develop targeted therapies faster.

- *Develop personalized treatments and care.* Through AI analytics, health care providers can discover, present, and utilize information based on an individual's unique characteristics. This facilitates the delivery of care personalized for each patient.

Possible benefits

Earlier diagnosis that improves effectiveness and reduces costs.
A comprehensive and detailed view of a patient's medical status and genetic makeup can enable early diagnosis, even before symptoms appear. Earlier treatment is often more effective, less costly, and promotes healthy lifestyle changes.

More effective treatment.
Medicine designed specifically for an individual (instead of a "one size fits all" drug) can be more effective in treating medical issues, potentially saving money and resources in the long run.

Healthier social norms.
A more empirical, data-driven understanding of how lifestyle affects health care outcomes can inform and foster healthier societal behaviors.

Smarter hospitals
(Hospital Management)

Use predictive AI to forecast peaks and valleys in patient volume and then adjust hospital staffing and resource levels accordingly.

Issue/Opportunity
Health care organizations don't just make medical decisions on behalf of their patients; they also make operational decisions on behalf of their own business. And like any business, hospitals need to ensure that supply adequately meets demand. Demand for health care rises and falls in response to a complex range of factors, making it difficult for hospitals to optimally allocate their supply of critical resources such as medical equipment and staff.

How AI can help

- *Predict future resource needs based on historical data and real-time situation analysis.* Data mining, modeling, and AI can help organizations make predictions based on historical data and real-time situation analysis. For example, AI-based prescriptive analytics can provide indications of future resource needs for different scenarios (e.g., determining the optimal inventory to satisfy an uptick in hospital readmission, or what new machinery/supplies are needed to meet seasonal demand).

- *Comprehensively analyze large amounts of detailed data.* AI and machine learning can analyze all available data comprehensively and in great detail can provide a much clearer picture of health status.

- *Identify high-impact patterns and trends.* Thorough, AI-enabled analysis of various data sources can reveal hidden trends and patterns with the potential for large-scale impact (e.g., areas at high risk of supply shortages).

Possible benefits

Faster resource level adjustments, leading to lower costs and better outcomes.
When health care organizations are aware of possible future scenarios, they can respond more quickly (or even take pre-emptive action), potentially reducing costs and creating better health outcomes.

Anticipating and addressing major risks before they happen.
Prescriptive analytics enabled by AI can highlight areas of large-scale risk, helping organizations avoid institutional failure and sub-optimal health outcomes for patients.

Emerging AI use cases in Life Sciences & Health Care

Emerging AI use cases in Life Sciences & Health Care

Needle in a haystack
(Biomarker Discovery)

Origin of species in the age of AI
(Synthetic Biology)

Using AI to analyze life sciences data and identify novel biomarkers through pattern recognition.

Using AI to engineer new synthetic life forms that serve useful purposes.

When it comes to discovering and developing new drugs, the biggest breakthroughs are often hidden in massive and complex datasets. Machine learning and deep learning techniques can be very effective at analyzing life sciences data and using pattern recognition to identify novel biomarkers. This can increase the efficiency of biomarker analytics and accelerate the drug development process—enabling life sciences companies to discover innovative treatments more quickly and get them to market faster.

Advanced research is currently underway that is focused on using machine learning and deep learning to synthesize new life forms with valuable new capabilities. At this early stage of experimentation, the emphasis is largely on computational biology and chemical manufacturing applications that use AI to manipulate simple organisms and assist with biolab automation. However, over time, the scope of research is sure to expand—with successful applications getting more funding and unsuccessful applications getting cut off.

Emerging AI use cases in Life Sciences & Health Care

Emerging AI use cases in Life Sciences & Health Care

Simulating new drugs in a virtual lab

(Virtualized Drug Discovery Lab)

Using AI, quantum physics, cloud computing, and a molecule database to create a "digital twin" for simulating the activity of potential new drugs.

A digital twin is a virtual model that perfectly mimics the characteristics and behaviors of something that exists in the physical world. Applied to the task of drug discovery, digital twins have the potential to dramatically improve the efficiency and effectiveness of drug research and development. Drawing on content from comprehensive molecule databases, AI algorithms can predict the interactions between molecules and proteins at the atomic level, and can map out potential drugs' pharmacologic properties. This will make it easier for biopharmaceutical companies to pick the best candidates for clinical studies—accelerating the R&D process and reducing the amount of failed experimentation.

Supply chain, heal thyself

(Self-healing Supply Chains)

Using AI to create optimized, proactive supply chains that can automatically address unexpected disruptions.

In life sciences, many of today's supply chains are inflexible, slow-to-respond, and reactive—problems that revealed themselves all too clearly in the early days of COVID when supply lines ground to a halt and expiring goods were stuck wasting away in warehouses and shipping ports around the world. AI can help life sciences supply chains predict supply and demand more accurately, improve visibility and transparency, automate warehouses using RPA, and enable just-in-time inventory management and distribution throughout the global supply network. In addition, AI can proactively monitor supply chain problems and autonomously perform the vast majority of mitigation activities on its own—only requiring human involvement for truly exceptional issues, and then using machine learning to understand how to address such issues autonomously in the future.

Emerging AI use cases in Life Sciences & Health Care

AI that heals

(Digital Health Care Providers)

Using AI to help medical professionals provide a wide range of health care services.

Although there is no good substitute for human touch and compassion, AI-powered systems and robots have the potential to assist with many other aspects of health care delivery, including helping diagnose and treat common infections; assisting nurses with patient monitoring; helping radiologists analyze and interpret imaging data; and even supporting surgeons as they prepare for and perform complex operations. And as AI becomes more capable—and patients and health care professionals become more comfortable with it—the potential use cases will likely only grow more sophisticated.

Emerging AI use cases in Life Sciences & Health Care

True grit

(Predictive Behavioral Model)

Using AI to select clinical trials participants who won't drop out.

Clinical trials are a critical bottleneck in the drug approval process—and one of the biggest challenges with trials is choosing patients who will have the staying power to see things through to the end. A clinical trial is demanding and time consuming, and participants have no idea if they are receiving the actual treatment or a placebo, making it hard for them to stay motivated. Patient attrition is very costly ($41k per participant, on average) and in some cases can even invalidate a trial completely, pushing the process back to square one. AI can help by analyzing behavioral factors such as socio-economic data, education, spending patterns, and emotional support—in addition to traditional clinical factors such as disease protocol data—calculating a "grit" score that shows which participants are most likely to remain fully engaged until the trial is complete. AI can also help life sciences companies design trial protocols, engagement strategies, and participant interventions that are more personalized and effective—further reducing attrition and fueling continuous learning and improvement.

Emerging AI use cases in Life Sciences & Health Care

Beyond the microscope

(Digital Pathology)

Using AI to increase the speed and accuracy of disease diagnosis.

Pathologists use studies of body fluids and tissues (such as blood tests and biopsies) to understand the causes, nature, and effects of diseases. This process has long revolved around looking at glass slides through microscopes (unlike radiology, where traditional processes have been almost entirely supplanted by digital technologies and workflows). However, as digital pathology gains traction, AI is expected to play an increasingly important and valuable role in diagnosing and treating diseases. For example, with medical images such as the output from a cryogenic electron microscope, AI can discern patterns and details that are imperceptible to humans—helping pathologists quickly and accurately determine the best way to treat a patient's disease.

Emerging AI use cases in Life Sciences & Health Care

Health care you wear

(Patient Vitals Monitoring)

Using AI to analyze and identify anomalies in patient vitals data captured through wearable devices.

Smart watches and other wearable sensor devices are all the rage these days. And for good reason. Data captured from body sensors and wearable devices—such as bracelets, heart monitors, patches, and sensor-enabled clothing—can not only be used to track the wearer's activity and fitness levels for recreational purposes; it can also be used for medical purposes to continuously monitor a patient's vital signs remotely or in hospitals and care clinics. Health care providers can then use sophisticated tools based on AI and machine learning to analyze multidimensional time-series data and identify anomalies that require attention. This breakthrough capability enables a patient to receive high levels of monitoring and care without being stuck in a hospital bed wired to a bunch of machines.

Remembering to take your medicine

(Medication Compliance
& Remote Patient Monitoring)

Using AI image recognition and smartphones to remotely monitor outpatient behavior and whether patients are taking their medications as directed.

Getting patients to take medications on time is a seemingly trivial problem that is actually very serious and surprisingly difficult to solve. And it's especially crucial for drug trials, where lack of compliance with a trial's protocols can completely invalidate the results. Thankfully, using AI image recognition and basic smartphone capabilities, health care providers can now offer patients an easy way to demonstrably adhere to drug trial protocols. Also, AI can be used to monitor and analyze many other aspects of outpatient behavior, including nutrition and sleep patterns. This additional insight can be extremely valuable, since the behavior of outpatients can vary widely.

Seeing what the human eye can't

(Diagnostic Image
Enhancement in Radiology)

Using AI technologies to enhance and analyze radiological images.

Radiologists specialize in diagnosing and treating injuries and diseases using medical imaging procedures that can see inside the human body, such as X-rays, MRIs, CT scans, PET scans, nuclear medicine, and ultrasounds. Earlier uses of AI for diagnostic imaging were dependent on manual feature selection to define the "class" of the image, which limited their effectiveness. However, as future AI technologies grow more capable and accurate they are expected to be increasingly used to enhance and analyze images in which key structures are not visible to the human eye—augmenting the images and creating detail within pixilation so radiologists can make an accurate diagnosis. AI can also be helpful in situations where human radiologists are not available, or where their case load is overwhelming.

The key to success is to start small but think big.

Conclusion

Although AI adoption rates and maturity levels vary widely across industries—and even within them—there seems to be no question that AI is here to stay. In fact, AI is quickly becoming a competitive necessity for nearly all types of businesses—driving unprecedented levels of efficiency and performance and making it possible for businesses of every shape and size to do things that simply weren't possible before.

The key to success is to start small but think big. According to a recent Deloitte survey—*State of AI in the Enterprise,* 3rd Edition—74 percent of businesses surveyed are still in the AI experimentation stage with a focus on modernizing their data for AI and building AI expertise through an assortment of siloed pilot programs and proofs-of-concept, but without a clear vision of how all the pieces fit together. By contrast, only 26 percent of businesses surveyed are focused on deploying high impact AI use cases at scale, which is when the real value kicks in.

In this compendium, we've highlighted many of the most compelling and business-ready use cases in every major industry. However, a use case is only as good as the extent to which it is actually used. No matter how compelling an AI use case might seem on paper, its full value can only be unlocked if you embrace and deploy it at scale across your broader enterprise and ecosystem.

Beena Ammanath
Executive Director of the Deloitte AI Institute
Deloitte

Contact us

Acknowledgements

Our insights can help you take advantage of chance. If you're looking for fresh ideas to address your challenges, we should talk.

Asif Dhar
US Life Sciences and Health Care Industry Leader, Vice Chair
Deloitte Consulting LLP
adhar@deloitte.com
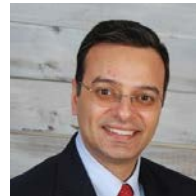
Nitin Mittal
US AI Co-Leader
Deloitte Consulting LLP
nmittal@deloitte.com
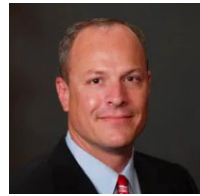
Dan Ressler
US Risk & Financial Advisory Life Sciences & Health Care Industry, Leader, Principal
Deloitte Risk & Financial Advisory
dressler@deloitte.com

Irfan Saif
US AI Co-Leader
Deloitte Risk & Financial Advisory
isaif@deloitte.com

Lynne Sterrett
US Consulting Life Sciences & Health Care Industry Leader, Principal
Deloitte Consulting LLP
lsterrett@deloitte.com

Beena Ammanath
Executive Director of the Deloitte AI Institute
Deloitte
bammanath@deloitte.com

Endnotes

1. Source: Deloitte analysis

2. "Scaling up AI across the life sciences value chain," *Deloitte Insights,* 2020.

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