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Thematic Intelligence
Healthcare

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Artificial Intelligence in Healthcare

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Executive Summary

Triple-digit growth in AI is expected by 2030

Artificial intelligence (AI) is a fast-growing industry. GlobalData expects every segment of the AI market to grow over the next decade. According to GlobalData forecasts, the AI market was worth $103 billion in 2023. By 2030, it will have grown at a compound annual growth rate (CAGR) of 39% to over $1 trillion. Demand for AI consulting and support services and conversational platforms will drive market growth, bolstered by the adoption and increased interest in generative AI (GenAI).

AI is an essential technology for healthcare companies. In the pharma and medical devices industry, AI rapidly accelerates drug discovery and manufacturing and enables supply chain efficiencies. For healthcare payors and providers, AI tackles staff and skill shortages and increases administrative efficiency.

AI has the potential to transform patient experiences

Although AI capabilities are still in their early stages, it has already begun revolutionizing the drug discovery process by streamlining research and potentially reducing the time and cost required to bring new drugs to market, addressing a broad range of unmet needs. AI also shows great promise in medical diagnostics, enhancing surgical precision, speeding up image analysis, and improving disease diagnosis. Automation of routine tasks by AI can allow healthcare providers to see more patients, while personalized care, predictive analytics, and faster diagnoses can lead to better patient outcomes and a more positive patient experience.

Data privacy concerns could hinder the growth of AI

Developing accurate AI models requires access to extensive, high-quality patient data from diverse populations. The use of healthcare data for AI development raises significant privacy concerns for both organizations and individuals. For instance, employing large language models (LLMs) like ChatGPT to improve access to health information could impact patient privacy. Therefore, developing new data-sharing regulations and methods that preserve privacy is essential for the widespread adoption of AI applications in healthcare.

Leaders

Below are some of the leaders in AI adoption across the healthcare industry.

Pharmaceuticals

AstraZeneca, Bristol Myers Squibb, Eli Lilly, GSK, Johnson & Johnson, Novartis, Pfizer, Roche, Sanofi.

Medical devices

3M, GE Healthcare, Medtronic, Philips, Zimmer Biomet.

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Related reports

- Artificial Intelligence
- Precision & Personalized Medicine
- The Future of Healthcare

Report type

- **Single theme**
- Multi-theme
- Sector scorecard

Players

This section provides an overview of the key players in the AI theme, broken down using our value chain framework. For more details, please download our AI report.

The table below shows the leading AI vendors and examples of leading AI adopters and vendors for the healthcare industry across the advanced AI capabilities segment of the AI value chain.

Key players in AI

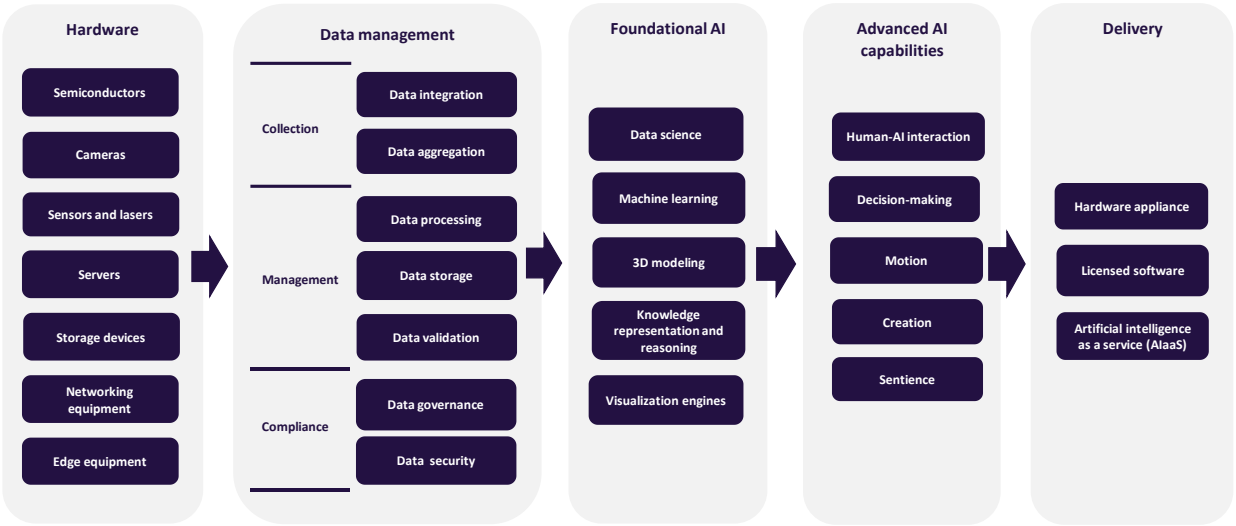
Advanced AI capabilities	Leading AI vendors	Leading AI adopters in healthcare	Specialist AI vendors in healthcare
• Computer vision • Conversational platforms • Other sensory AI • Brain-machine interfaces **Human-AI interaction**	Alibaba Alpha MOS Alphabet (Google, Waymo) Amazon Apple Aryballe Baidu Generic Robotics IBM iFlytek Kernel Megvii (Face++) Merative Meta Microsoft Mobileye Neuralink Nvidia Odometric Paradromics Sanctuary AI SenseTime Synchron Tastewise Telsa Tencent	3M AstraZenca BenevolentAI GE Healthcare GSK Mayo Clinic Medtronic Novartis Pfizer Philips Roche Sanofi	AICure Atomwise Druid AI Odin Vision
• Discovery • Planning • Forecasting **Decision-making**	ABB Alibaba Alphabet (Google, Waymo) Amazon Aurora Baidu Basler Cognex GM (Cruise) Hyundai (Boston Dynamics) IBM Keyence Lockheed Martin Microsoft Midea (KUKA) Mobileye Motional Northrop Grumman Oracle Pony.ai SAS Teradyne Tesla Thales Group	AstraZeneca Bristol Myers Squibb Eli Lilly GE Healthcare Imperial College London Novartis Pfizer Sanofi Zimmer Biomet	Anumana Atomwise BenevolentAI Biostate AI Certis Oncology Solutions CytoReason Illumina Insilico Medicine nference Owkin Paige.AI Profluent Tsinghua University
• Smart robots • Motion control **Motion**	ABB Amazon Basler Cognex Festo iRobot Keyence Midea (KUKA) Omron Robotiq Teradyne	GE Healthcare GSK Johnson & Johnson Mayo Clinic Medtronic Pfizer	Intuitive Surgical
• Audio • Visual • Text • Other creativity **Creation**	Aifnet (Deep Dream) Aiva Technologies Alibaba Alphabet (Google, Deepmind) Amadeus Code Anthropic Artbreeder Audiocipher Baidu Big Sleep Boomy Cohere DeepAI Ecrett Music Hugging Face IBM Jasper Art Meta Microsoft Midjourney Mistral AI NightCafe OpenAI Output Shutterstock (Amper) Stability.ai StarryAI WOMBO (Dream)	3M Mayo Clinic	Insilico Medicine Nabla

Source: GlobalData

Value Chain

The graphic below shows our value chain for artificial intelligence (AI). It is split into five segments: hardware, data management, foundational AI, advanced AI capabilities, and delivery.

The artificial intelligence value chain
An overview



Source: GlobalData

For detailed analysis of the AI value chain, read our central AI report.

Advanced AI capabilities

This report focuses on use cases for the advanced AI capabilities segment of GlobalData's AI value chain. Below is a brief description of advanced AI capabilities.

When building AI systems, a fundamental question is: what capabilities or behaviors make a system intelligent? The first step is to expand on our earlier definition and describe AI as any machine-based system that perceives its environment, pursues goals, adapts to feedback or change, provides information or takes action, and even has self-awareness and sentience.

Certainly, humans and animals in the higher layers of the evolutionary tree can interact with their environment, adapt to its changes, and take action to achieve their goals, such as individual and species survival. Whether animals have self-awareness or ethics is an open debate, but they have sentience. This is relevant as even a weak AI approach can build systems that behave intelligently but are far from sentient.

The five categories of advanced AI capabilities

Human-AI interaction, decision-making, motion, creation, and sentience

Source: GlobalData

For a full AI technology briefing, including a breakdown of the five advanced AI categories, please see the central AI report.

The Impact of AI on Healthcare

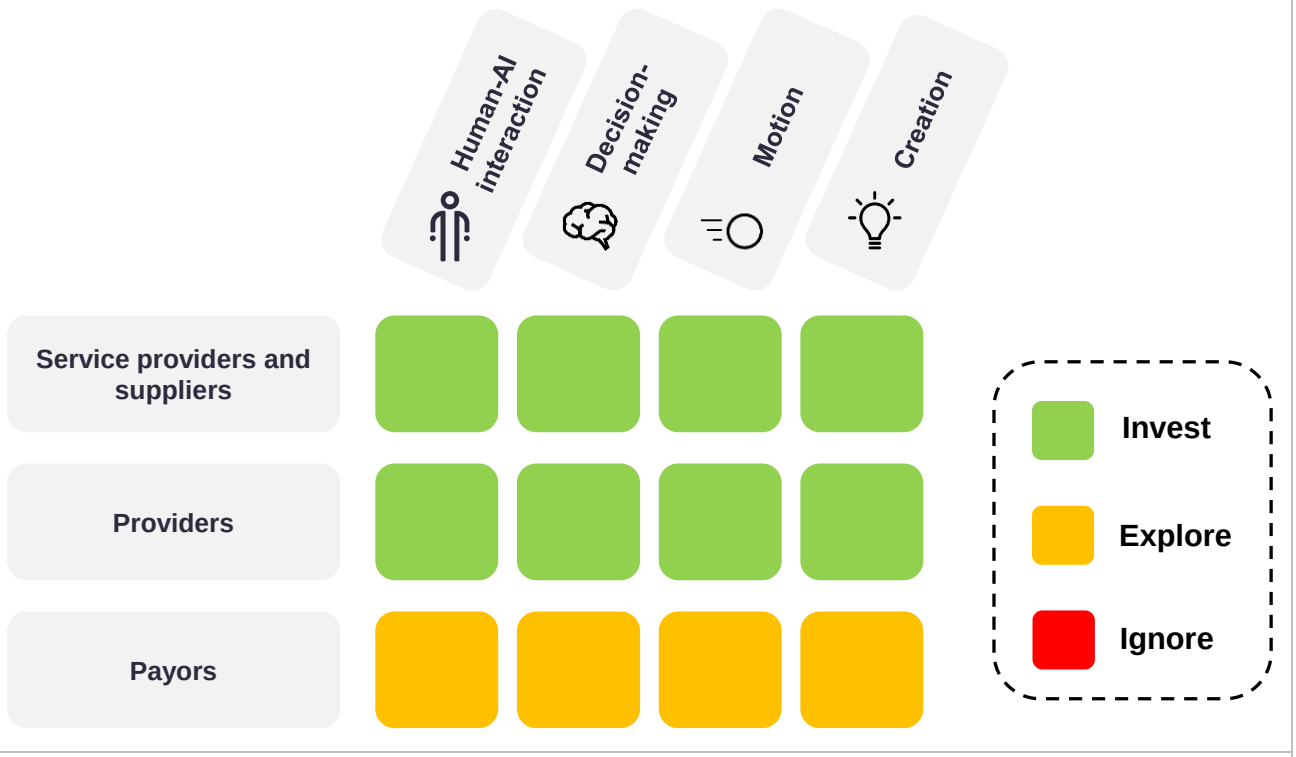
The following section looks at the areas of AI in which healthcare providers and payors, pharmaceutical, and medical device companies should invest.

Healthcare providers, payors, service providers, and suppliers

The matrix below details the areas of AI in which healthcare providers, payors, service providers, and suppliers should focus their time and resources. They should invest in the technologies shaded green, explore the prospect of investing in the technologies shaded yellow, and ignore the technologies shaded red.

Thematic investment matrix for healthcare providers, payors, service providers, and suppliers

AI in healthcare



Source: GlobalData

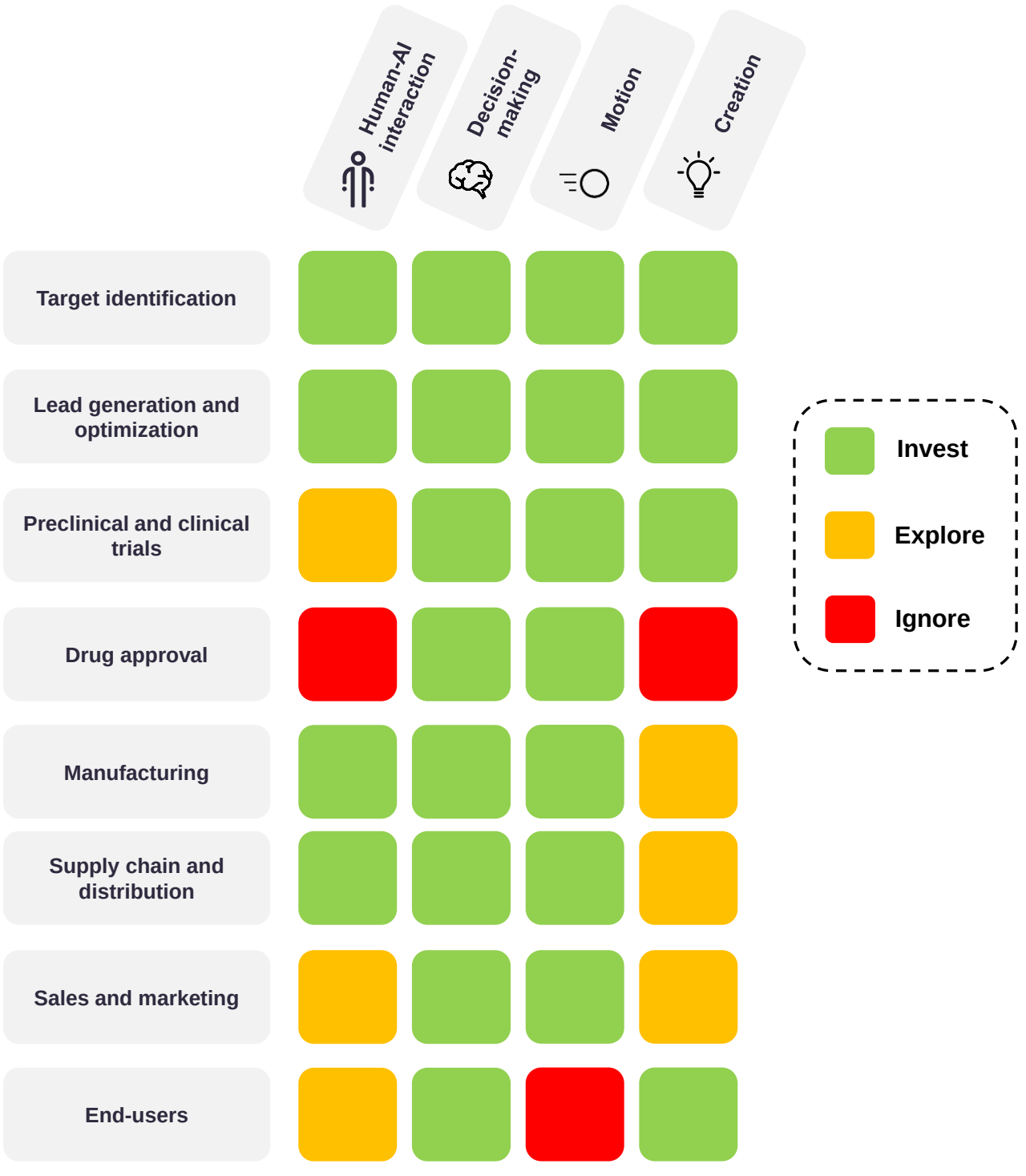
AI can automate many routine and administrative tasks for service providers and suppliers, such as updating patient records and streamlining appointments, easing the workload for doctors and nurses, and allowing increased focus on patients. AI can also support the shift from hospital-based to home-based patient care using remote patient monitoring, wearable devices, and virtual assistants.

There is huge potential for AI in medical diagnostics. AI-tools can be added to current medical imaging techniques, such as computer tomography (CT) and magnetic resonance imaging (MRI) scans, for faster analysis of images and diagnoses of diseases. AI-based systems can also transform surgical operations. AI-assisted tools can help surgeons in critical situations where enhanced surgical navigation, object identification, increased imaging details, or spatial understanding would optimize a procedure. For example, in April 2024, Medtronic launched a Live Stream technology that uses AI algorithms to give surgical insights for robotic-assisted and laparoscopic surgery. AI is also improving the surgical field with remote surgery, where surgeons use robots to perform surgery when they are in a different location to the patient. The AI-powered Da Vinci robot system, created by Intuitive Surgical, has transformed the field of minimally invasive surgery. These surgeries can reduce human effort, improve patient outcomes, and reduce hospital stays.

Pharma

The matrix below details the areas of AI in which pharma companies should focus their time and resources. They should invest in the technologies shaded green, explore the prospect of investing in the technologies shaded yellow, and ignore the technologies shaded red.

Thematic investment matrix for pharma
AI in pharma



Source: GlobalData

Although AI is beneficial for areas across the pharma industry, companies should focus on investing in AI for drug discovery, accelerating processes, and enhancing efficiency in manufacturing and supply chains.

Advancements in AI have significant potential to improve the quality of care and health outcomes. This includes increasing the frequency and speed of getting new drugs to market, thereby increasing profitability for pharma companies. AI also enables faster and earlier diagnoses, access to improved clinical trials, and the potential for personalized medicine.

In drug discovery, AI can analyze vast amounts of data to detect patterns and trends and assess the biological performance of drug candidates to find the best for clinical testing. GenAI, for example, can predict novel drug candidates or molecular structures based on patterns and trends found in data. Biotechnology company Insilico Medicine announced in April 2023 the successful discovery of a CDK8 inhibitor for the treatment of cancer using its GenAI-driven learning platform named Chemistry42. In February 2024, 4B Technologies' drug FB1006, a new potential treatment for amyotrophic lateral sclerosis (ALS), entered into an investigator-initiated clinical trial. The drug was discovered and developed entirely using AI, from target identification to efficacy assessment. AI also enabled researchers to speed up patient screening.

Generative AI can also be used to design novel chemical compounds. For example, researchers at the University of Toronto have developed an AI system that can create proteins not found in nature (Lee *et al.*, 2023). The system uses the same technology as OpenAI's Dall-E image creation platform. In the future, this could help discover new drug candidates with unique properties, potentially creating treatments for diseases that currently have no effective options.

AI can also accelerate and digitalize clinical trial processes so studies can be completed faster. AI can optimize the design of patient-centric clinical trials and allows technologies such as wearables, heart monitors, and body sensors to collect patient data remotely and less invasively. AI algorithms specifically help data collection by identifying patterns and improving the accuracy of datasets. Remote monitoring and decentralized clinical trials provide an attractive way to increase patient participation and access more diverse groups of participants.

Pharma companies should invest in AI tools for efficiency in manufacturing, distribution, delivery, and streamlined supply chains. Through AI, many areas of a medical supply chain can be automated, including inventory tracking, and managing and restocking processes. Investing in AI-powered tools such as robotics and drones will also speed manufacturing processes by assisting in supply delivery. ChatGPT could create optimization plans and predictive maintenance schedules and detect anomalies in available information.

Medical devices

The matrix below details the areas of AI in which medical device companies should focus their time and resources. They should invest in the technologies shaded green, explore the prospect of investing in the technologies shaded yellow, and ignore the technologies shaded red.

Thematic investment matrix for medical devices
AI in medical devices

Source: GlobalData

Medical device companies' investment in AI should not be too dissimilar to that of pharma companies, as the industry is also under pressure to innovate. For manufacturing, AI can assist in quality control to ensure new products are fit for

regulatory compliance. AI-enabled equipment can inspect products during the manufacturing process for defects, alert manufacturers of repeated defects, and find the cause of errors. Using AI to automate and complete quality-control checks for medical devices can also help increase the production line's efficiency over time.

How AI helps tackle the challenge of drug discovery and development

Drug discovery and development is extremely expensive and time-consuming. It takes between 12 and 18 years for a drug to reach the market, at an average cost of around $2.6 billion. Drug discovery processes alone involve many stages, including target identification and validation, assay development and screening, hit identification, lead optimization, and selection of candidates for further clinical development. A successful outcome is also unlikely, with only 10% of drug candidates making it through clinical development (Sun *et al*., 2022). The low success rate and high cost have created a need for alternate approaches.

Over the past several decades, advances in computational technology have allowed increased exploration of the vast chemical space. Computer-aided design and drafting, called "in silico" approaches (experimentation performed by a computer), are widely used to enhance traditional drug discovery methods and can reduce the time and cost of drug development, with significantly higher hit rates. However, the success rates are still low.

AI has shown enormous potential to further enhance in silico methods by rapidly understanding and exploring the expanding chemical space, driven by the ever-growing amount of big biomedical data. Training AI on the vast amounts of genomic data, health records, medical imaging, and other patient information has allowed an increased understanding of the biological mechanisms of diseases. AI-assisted mapping of disease pathways and protein and drug interactions through specialist vendors has created a deeper understanding of targets and has assisted in identifying novel proteins and genes that can be targeted to counteract them.

AI can also be used to predict 3D structures of targets and accelerate the design of appropriate drugs that bind to them, through protein structure databases such as DeepMind's AlphaFold. Once a set of promising lead drug compounds has been identified, AI can then assist in candidate drug prioritization, ranking molecules for further assessment.

Aside from identifying drug targets, AI has transformed the virtual screening of compounds, such as identifying those that can bind to "undruggable" targets, de novo drug design, drug repurposing, and identification of treatment response biomarkers (Abou Hajal *et al*., 2024). AI algorithms have shown the potential to condense a typical four- or five-year exploratory research phase into less than a year, significantly reducing the time and cost to get a drug to market, which is particularly important for indications with few treatment options.

There have been some significant milestones in the use of AI in drug discovery since 2023. In January 2023, Absci became the first company to create and validate de novo antibodies in silico using zero-shot generative AI. Creating de novo therapeutic antibodies in silico could reduce the time it takes to get new drug leads into clinical trials by more than half. The zero-shot generative AI model generates novel antibody designs that are not found in any existing databases.

In February 2023, Insilico Medicine was granted orphan drug designation by the FDA for INS018_055, a small molecule inhibitor treatment for idiopathic pulmonary fibrosis (IPF). INS018_055 was discovered and designed through the company's generative AI platform, Pharma.AI. That year, the drug was the first of its kind to be given to humans in a global, randomized Phase II clinical trial. The total time from discovery initiation to the start of Phase I took under 30 months for INS018_055, representing a significant increase in speed for therapeutic asset development in the pharma industry.

In May 2024, Google DeepMind released the third version of AlphaFold. The previous models were built to solve the issue of predicting the 3D structure of a protein from its amino acid structure. AlphaFold 3 does more by predicting the structure of almost all biological molecules and modeling the interactions between different molecules. This marks the first time a single system can predict interactions between almost all molecules with this much accuracy. How a molecule and biological systems will react depends on the interactions between different molecules. Usually, it takes years for scientists to understand molecular interactions; with AlphaFold 3, this will take significantly less time.

Despite these advancements, most novel drugs developed using AI are in the preclinical or discovery stages, and it could be many years before an AI-based therapy is approved. While AI has shown the potential to transform drug discovery

processes, it faces many challenges. These include the quality and appropriateness of data, continued assurance of drug safety and efficacy, educating the scientific community to increase buy-in, and issues around intellectual property rights. Although the impact of AI on traditional drug discovery is in its early stages, we have already seen that when layered into a traditional process, AI-enabled capabilities can substantially speed up and reduce the costs of running expensive experiments, which has the potential to be transformative for patients, medical providers, and the pharma sector.

How AI helps tackle the challenge of low success rates of clinical trials

Clinical trials face many challenges, including complexity, inflated costs, regulations, patient access, and recruitment. Patient recruitment is essential for the success of a clinical trial. However, around 80% of clinical trials globally fail to recruit and retain enough patients, leading to trial delays and excessive costs (Desai, 2020). Clinical trials are becoming increasingly complex, further intensifying the challenges in executing them. These issues can potentially limit the development of innovative drugs.

Clinical trials are essential to ensure the safety and efficacy of all potential drugs before they enter the market. However, this process remains slow, expensive, and unpredictable. AI tools can potentially improve the success and efficiency of clinical research.

The impact of poor recruitment on a trial is immense in terms of time and associated financial burdens. AI can identify potential candidates for clinical trials by analyzing vast amounts of patient data and medical records. It can also analyze social media content to identify specific regions where a condition is more prevalent, narrowing the search for an optimal cohort. Once the desired patient subgroups are detected, AI can also assist and accelerate trial recruitment.

Traditionally, eligible patients are found though hospitals or clinics, but often, when recruiting large numbers of people, only a few are eligible. AI technologies can alert medical staff and patients to trial opportunities and reduce unnecessary patient screening. It can also help simplify entry criteria to make it more accessible for potential participants. AI-based analysis can also provide insight into participant behavior, and researchers can use this information to design more efficient and effective clinical trials.

Furthermore, AI can analyze patients' genetic makeup, other physiological data, and lifestyle factors, helping to identify specific patient populations likely to benefit from a particular drug. A personalized treatment plan for a potential high-risk cancer patient could involve earlier screening, which may help with earlier diagnosis and treatment and lead to improved quality of life for the patient.

One example is Deep 6 AI, a platform that uses AI to streamline and increase patient recruitment for trials. The platform analyses large amounts of medical data, such as electronic health records (EHRs), pathology reports, and clinical notes, to find candidates that meet the criteria for a trial.

The average dropout rate for traditional clinical trials is about 30%, depending on the trial phase (CenterWatch, 2016). Patients may discontinue trial participation for various reasons, including inconvenience, the number of visits required, complex trial protocols, lack of support, and little or no reimbursement of expenses. Through AI, health assessments can be performed remotely in patients' homes, improving patient experience and ease during clinical trials and boosting patient participation and retention.

Decentralized clinical trials reduce reliance on in-person trial sites and overcome any barriers related to inaccessibility, especially for underrepresented populations. Patients' vital signs and other information can be collected remotely through wearable devices and mobile apps. Real-time tracking of medication can also help reduce medical non-adherence. The traditional process of manually tracking medication, through reliance on a patient's memory, is prone to error and can limit clinical trial outcomes.

One example is the clinical trial management platform AiCure, an interactive medical assistant that helps to spot patients at risk of non-adherence. Patients in a clinical trial sign up to the platform via a mobile app, where they record their progress and receive reminders to take medication. Patients video themselves taking their clinical trial medication as proof, and the AI platform can then identify the correct patient and pill to ensure the patient is engaging with the clinical trial properly.

Each clinical trial generates vast amounts of data that researchers must manually review to uncover meaningful insights. AI can analyze this data efficiently, finding patterns that may be missed by human analysis. For example, AI-based models can predict the toxicity of a potential drug candidate, helping researchers select suitable compounds that can then be used in a trial. Organizations can also use AI technologies to find suitable existing data for new trials, reducing the need to start from scratch across trials and speeding up the design process.

While the application of AI shows promise to increase the efficiency of clinical trials, universal data management and inherent bias in data need to be addressed to use AI successfully. The differences in regulation between countries limit the scope of collaboration and cooperative research and may restrict the ability to train AI systems at a global scale. AI-based systems also raise data security and privacy concerns. Therefore, maintaining the confidentiality of medical records used in clinical trials is crucial.

How AI helps tackle the challenge of staff and skills shortages

Global labor shortages, alongside a lack of critical talent, have left companies worldwide and across sectors struggling to fill vacancies. Stress from understaffing, long hours, increased hospital waiting times, patient frustration, and mounting administrative burdens are among the reasons for increased dissatisfaction. Research by the Association of American Medical Colleges in the US predicts that there will be a shortage of 139,000 physicians by 2033.

Meanwhile, in low- and lower-middle-income countries, a lack of education and training contributes to staffing shortfalls. With healthcare facing challenges from other factors, such as aging populations and increasing demand, the shortage of staff and skills in healthcare is only exacerbating the stress these systems are under. The World Health Organization (WHO) predicts a global shortfall of 15 million healthcare workers by 2030.

AI can automate several administrative tasks for healthcare professionals, including maintaining records, report writing, and appointment scheduling. This can alleviate stress and free up time for nurses and doctors, allowing them to focus on patients and other pressing issues. For patient consultations, AI is transforming the healthcare documentation process.

French digital health start-up Nabla has developed a digital assistance tool for doctors called Copilot. It automatically translates conversations between doctors and patients and converts them into various documents, including prescriptions, confirmation letters, and consultation summaries, as well as updating patient medical records. The platform uses OpenAI's Generative Pre-Trained Transformer 3 (GPT-3). The company is aiming to expand into the US healthcare market.

AI can also help with staff scheduling. For example, Trusted Health's nursing staff platform, called Works, alleviates the manual work of nurse managers by sifting through nursing schedules to find open shifts.

AI automation is beneficial for increasing efficiency at both large hospitals and primary care organizations alike (e.g., general practice and small clinics), which in turn will reduce time and save costs. For new hiring programs, AI can accelerate and optimize training processes, onboarding new staff into their roles more efficiently. As innovation accelerates, AI can optimize additional training and reskilling for current employees.

Furthermore, medical chatbots can also schedule patient appointments and set reminders to reduce the number of forgotten appointments and cancellations. Some patients are even using AI chatbots for self-diagnosis. These include OpenAI's ChatGPT, Microsoft's search engine Bing (which incorporates OpenAI's software), and Google's Med-PaLM2. Med-PaLM2 is an LLM from Google Research, trained on a massive medical dataset and designed for the medical domain. It can summarize insights from various medical texts and was the first LLM to perform at "expert" level on US Medical Licensing Exam-style questions. A study from medRxiv used OpenAI's GPT-3 to assess the accuracy of diagnosis for 48 prompts phrased as descriptions of patients' symptoms. Among all cases, GPT-3 had the correct diagnosis in its top three answers for 88% of cases, compared to 96% for physicians and 54% for individuals with no medical training (Levine *et al*., 2023).

AI will also help transform future emerging technologies in healthcare. One example is the adoption of medical robots. Healthcare providers will increasingly invest in medical robots to compensate for staff shortages and improve the standard of care. Technological innovation aims to make robots more intelligent, independent, and better able to collaborate through the integration of AI. Care robots could enhance the nursing of elderly patients, assist with tasks

around mobility and exercise, or provide companionship and social engagement. Care robot assistance would reduce the number of caregivers required for day-to-day care.

Aging populations have increased the demand for healthcare as the prevalence of age-related diseases such as dementia grows. AI can support the increasing use of virtual care and telemedicine technologies. For example, AI can assess a patient's health from remote monitoring devices, helping doctors analyze patient data faster, identify trends, and make quicker and more accurate diagnoses. In the future, LLM chatbots may interact with patients and diagnose diseases. However, many issues remain, including data privacy and inaccurate information, racial and gender bias ingrained in data sources, and potential accountability debates if a patient is harmed after following a chatbot's advice.

How AI helps tackle the challenge of medical imaging and diagnosis

Medical imaging is an essential tool to support disease diagnosis and treatment. The increasing use of medical imaging and the adoption of advanced technologies have resulted in additional burdens for radiologists. Without help from technologies such as AI, radiologists are tasked with manually checking large volumes of images. As a result, radiologists may be unable to devote sufficient time to each case, leading to errors and delays in diagnosis for patients.

Disparities in imaging access significantly impact patient outcomes. The availability of imaging services can be limited, especially for populations living in low-income countries. Some hospitals may not be able to afford newer high-tech imaging modalities. Low-resolution images decrease the accuracy of the assessment of medical conditions, and the outcome of a patient may be affected by the general imaging expertise of the institution.

Radiologists and pathologists routinely evaluate thousands of medical images to identify and diagnose diseases. However, inaccurate diagnoses due to human error or subjective interpretation may impact patient outcomes, especially if the radiologist is overburdened with work.

AI can assist in medical imaging analysis by viewing these medical images, saving radiologists valuable time. AI can distinguish abnormalities from normal findings by detecting minor image alterations, even spotting unseen abnormalities that the human eye cannot identify. AI can also improve the imaging of low-quality scans. Low-quality images greatly reduce the patient's standard of care by leading to repeat scans, prolonged time to analyze and establish a diagnosis, and increased cost of care. Improving imaging quality gives healthcare professionals a clearer view of the patient's pathology and reduces inequalities caused by the disparity of imaging equipment among hospitals and locations.

Researchers at the MIT Jameel Clinic have developed a new AI tool, Sybil, to predict the risk of a patient developing lung cancer within six years. Sybil analyzes low-dose computed tomography (CT) scans of lungs, currently the most common screening method for lung cancer. The study, published in the Journal of Clinical Oncology, demonstrated that Sybil predicted cancer within one year with an average of 91% accuracy (between three datasets) and 79% accuracy within six years (Mikhael *et al.*, 2023). Although still in its early stages, this example demonstrates the potential of AI-assisted predictive analysis of diseases.

AI-assisted medical imaging has the potential to revolutionize cancer detection and characterization. For example, experts at the Royal Marsden NHS Foundation Trust, the Institute of Cancer Research, London, and Imperial College London developed an AI tool in 2023 to detect whether an abnormal growth in a CT scan is cancerous. Their study in April 2023 showed that their AI model could identify high-risk individuals for 82% of growths that were later found to be cancerous. This technique can derive important information from CT scans that are invisible to the human eye. This AI model could speed up cancer diagnosis and treatment, which is significant because the earlier cancer is detected, the easier it is to cure. Initial studies show good results, but more tests must be done before these types of tools can be implemented into healthcare systems.

How AI helps tackle the challenge of precision and personalized medicine

There has been an important shift to precision and personalized medicine in recent years. The classic one-size-fits-all method is changing to tailored treatments that consider individual differences in genetics, lifestyle, and environment. This shift acknowledges that even if patients share the same diagnosis, their unique characteristics can lead to different responses to the same treatment, affecting treatment outcomes. AI is an important tool for overcoming these challenges and supporting the development of personalized care.

One key obstacle to personalized healthcare is the management and analysis of complex and diverse medical data (e.g., medical history, reports, activity data from wearable devices, and real-time monitoring). The healthcare and pharmaceutical industries generate abundant data from many sources, including physician notes, pathology reports, EHRs, patient registries, genomics, clinical trials, wearable devices, and many more. A human cannot efficiently process and analyze all this data to create a personalized treatment plan for each patient. AI, in contrast, can process all the medical data, recognize patterns, and provide insights from these datasets. For example, machine learning (ML) algorithms can be used to identify relations between a mix of tests, medical history, and allergy information to propose a tailored treatment plan.

AI can also significantly advance the development of precision and personalized medicine by identifying novel predictive biomarkers critical to tailoring specific treatments to individual patients. For example, Ocean Genomics' AI platform identifies predictive variants in messenger RNA (mRNA) regarding a patient's expected response to a drug, and the technology is then used in drug discovery by pharmaceutical companies to develop personalized treatments. Similarly, platforms like Paige AI focus on identifying predictive and prognostic biomarkers to assist in connecting patients with the correct treatment, while Certis Oncology Solutions' CertisAI predictive medicine platform, launched in April 2023, uses data analytics and ML to study predictive biomarkers, enhance treatment strategies, and improve drug success rates.

The effectiveness of AI heavily relies on integrating big data, as big data is essential for the development and application of AI in the precision and personalized medicine field. AI models rely on high-quality data to enhance their decision-making capabilities. As these models process and train on more data, their accuracy and efficiency improve, leading to actionable insights that enhance drug development and precision in treatment and reduce the time and cost of bringing new drugs to the market.

How AI helps tackle the challenge of administrative efficacy

The ability to make quick and purposeful decisions has traditionally been a differentiating factor for healthcare systems. Healthcare systems are focusing on speeding up and streamlining administrative decision-making and reducing overheads. Furthermore, maintaining appropriate staffing levels is a priority for healthcare systems. However, they face challenges due to higher turnover rates and increased competition for healthcare employees. There is a shortage of talent across various job classifications, including medical staff, nursing, technology, support services, and administration. Additionally, wage inflation makes it harder to attract and retain good employees. Many healthcare practices are already operating at full capacity, making it difficult for staff to assist patients and complete administrative tasks comprehensively.

AI can help decrease administrative workloads in healthcare organizations, reducing costs and freeing up time for more in-person and clinical assessments. By automating tasks such as eligibility checks, unadjudicated claims, and data migrations, AI can reduce the administrative burden on hospital staff. For example, AI can expedite claims processing by identifying issues that could lead to rejection or delayed payment, such as missing information, wrong billing codes, or incomplete prior authorizations. This can help healthcare organizations streamline the claim reimbursement process and prevent higher out-of-pocket costs for patients due to denied claims. In addition, AI tools like ChatGPT can help doctors streamline their administrative work by automating tasks such as drafting letters, appealing denials, requesting prior authorization, and providing post-procedure instructions for patients. This can help physicians balance their workload and be more productive.

AI can also help administrative tasks in clinical trials, streamlining the process. AI technologies can analyze large amounts of data to detect patient subgroups that might benefit more from clinical trials. It can also analyze social media content and hospital medical records to identify eligible participants and simplify complex entry criteria. This can speed up the process of finding eligible participants and improve the efficiency of clinical trial recruitment.

Regarding supply chain processes in healthcare, such as those within pharma companies, AI can automate systems and use predictive analytics to improve supply chain processes, reducing the time spent on server administration and allowing companies to focus more on planning and core business functions. This can help increase control over suppliers and inventory and reduce margins for errors.

However, implementing AI in healthcare administration creates challenges and limitations. AI is imperfect and can make errors; there may be questions about accountability and responsibility in the case of negative outcomes. The full-scale implementation of AI in healthcare administration will require rigorous testing and validation. Healthcare professionals need to be able to rely on technology without needing continuous validation and checks. Testing and validation ensure that the AI tools are accurate, reliable, and safe to use in healthcare settings. Further, the implementation of AI in healthcare administration, while offering benefits such as faster healthcare delivery and mitigation of staff shortages, may have a damaging effect on doctor-patient relationships. Patients have expressed concerns about the lack of in-person interaction and the potential for increased medical errors when AI is used in clinical practice. Building trust and maintaining a strong doctor-patient relationship is crucial in healthcare, and the introduction of AI may raise concerns about the quality and personalization of care.

Case Studies

The following section includes selected case studies highlighting the use of AI within the healthcare sector.

Biostate AI uses AI to advance its RNA sequencing and analysis tools

Biostate AI was founded in 2023 and is based in California and Texas. The start-up works with academic, nonprofit, and industry partners to develop and implement generative AI uses that benefit human health.

In July 2024, Biostate AI released its Total RNA Sequencing technology suite, able to analyze all types of RNA, including non-coding RNA species, which all play important roles in biological processes. This is different from traditional RNA sequencing, which mainly captures information from mRNA. The Total RNA Sequencing technology enables extensive RNA data collection via their patent-pending Barcode-Integrated Reverse Transcription (BIRT) technology. This technology aims to better understand gene expression and regulation, improving comprehension of disease mechanisms and potential therapeutic targets.

In 2024, Biostate AI further launched the OmicsWeb Copilot, which is a conversational AI tool used to help biologists analyze and visualize data efficiently. The OmicsWeb Copilot currently uses advanced LLMs to understand requests and make personalized software and scripts for data analysis.

Furthermore, Biostate AI hopes this AI Copilot platform will help predict human and animal health changes, including toxicity and drug efficacy responses. Indeed, it demonstrated in 2024 that RNA expression taken from rats' blood before giving them a drug could accurately predict their survival. To size up this proof of concept to be able to predict the toxicity of drugs in humans, a lot more data must be collected, analyzed, and fed into the AI models for training.

Biostate's tools are part of a bigger trend of using AI in biosciences. The tools can address challenges in collecting and analyzing biological data. AI could potentially reduce the need for animal testing and manage data complexity.

As of 2024, Biostate AI has raised $4 million in funding from investors such as Catapult VC and Vision Plus Capital. It has also collaborated with Caltech and Twist Biosciences to further the predictive capabilities of AI in health science. Biostate AI also plans to work with hospital biorepositories, pharma and biotech companies, and academic researchers to scale their multi-omic (constituents within a cell) data collection and AI training.

Researchers from Tsinghua University are developing the world's first AI hospital

Tsinghua University in China is developing a so-called "Agent Hospital": a complete digital simulation of the medical treatment process, from disease outset to follow-ups post-treatment. LLMs support the doctors, nurses, and patients so they can perform tasks and communicate autonomously in this virtual environment.

The concept involves treating virtual patients with AI doctors. Tsinghua University uses large medical information databases (e.g., DNA sequencing, personal health, hospital, and patient records) and ML technologies to train their AI systems, making them capable of reasoning and medical diagnosis. As of 2024, the "hospital" has 14 AI doctors and four AI nurses.

Initially, the Agent Hospital aims to enhance its production process and use the AI hospital to train medical students to develop treatment plans. By simulating AI patients, students can practice developing treatment plans without harming real patients.

Virtual doctors are scheduled to be implemented into patient care at hospitals across China. The team at Tsinghua University claims that 10,000 patients could be treated in a few days, whereas human doctors would require at least two years to treat that number. The successful introduction of the Agent Hospital would address challenges in healthcare services by enhancing patient outcomes, healthcare operations, training, and access to high-quality, affordable healthcare.

However, AI doctors can only aid and will never fully replace humans, as uncertainty in medical practice is common. For example, the same disease can have different characteristics depending on the individual patient, and so treatment diagnoses and treatment options will vary.

GE Healthcare is using AI to advance cardiac care

In April 2024, GE Healthcare introduced Caption AI, software designed to facilitate quick and accurate cardiac assessments at the point of care when using their Vscan Air SL wireless handheld ultrasound device. The Vscan Air SL with Caption AI debuted at the 2024 American College of Cardiology Annual Scientific Session & Expo in Atlanta in April 2024.

This software aims to help healthcare professionals efficiently capture cardiac images during routine checkups, aiding in early disease detection and improving patient outcomes. The Vscan Air SL with Caption AI ultimately helps simplify the process of capturing cardiac images, which means those with limited ultrasound expertise can also conduct rapid cardiac assessments effectively. The Vscan Air SL device itself is noted for its portability and imaging capabilities, featuring single-crystal transducer technology that delivers high levels of resolution, depth, and sensitivity.

Caption AI offers real-time visual guidance to prompt users on probe movements and incorporates a quality meter to maximize the quality of the image. Upon image capture, the Auto Ejection Fraction (AutoEF) function swiftly calculates the left ventricular ejection fraction (LVEF), enhancing diagnostic efficacy. Moreover, users benefit from efficient scanning through features like AutoCapture, which automatically saves clips. Another feature is Save Best Clip, where you can select the best image loop for each view.

Cardiovascular disease (CVD) is the primary cause of global mortality, and its prevalence is projected to increase with population growth and aging. Timely detection of heart disease is crucial for better patient outcomes, yet providing swift echocardiographic assessments at the point of care poses challenges for resource-limited facilities and practices. The Vscan Air SL with Caption AI addresses this industry pain point by simplifying cardiac image capture, making it accessible even to non-expert ultrasound users. This innovation lowers the barrier for healthcare professionals to conduct rapid assessments, especially in settings where skilled sonographers are scarce.

Profluent launches a GenAI-designed gene editor

Current gene editing approaches can face challenges such as brute-force mutagenesis, resulting in low success rates. Berkeley-based start-up Profluent has used GenAI technologies to develop a gene-editing system named OpenCRISPR-1. The start-up uses LLMs fed with extensive biological data to enhance existing gene-editing techniques, specifically the well-known clustered regularly interspaced short palindromic repeats (CRISPR) technology.

Profluent trained its AI gene editor by inputting massive-scale DNA sequences and biological context to make millions of varied CRISPR-like proteins that do not appear in nature, thereby increasing the diversity of all known CRISPR families. These AI-customized gene-editing proteins are proteins inspired by natural structures but with unique molecular compositions. They have exhibited enhanced precision and efficiency in editing the human genome, reducing off-target effects and genetic inconsistencies. With more than 400 mutations compared to traditional CRISPR tools, OpenCRISPR-1 demonstrates a median rate of unwanted genetic modifications of less than 1%, making it a viable alternative for experiments requiring precise gene editing capabilities.

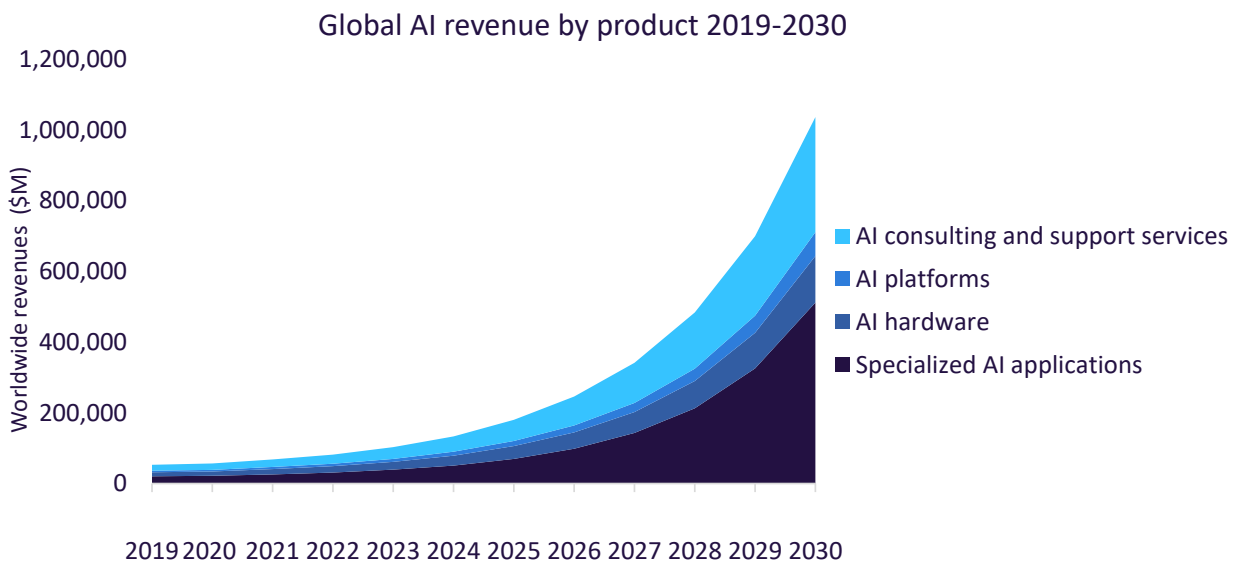
This shift from accidental discovery to intentional design enables precise and controlled genetic modifications, potentially revolutionizing therapeutic development for complex societal challenges. Additionally, Profluent has raised a total of $44 million, with Spark Capital leading a $35 million financing round in March 2024. The funding will support Profluent's growth, particularly in advancing its proprietary LLMs and datasets, improving wet lab capabilities, and enhancing CRISPR gene editing. This investment aims to enable the development and validation of innovative proteins, potentially advancing healthcare and disease treatment.

Market Size and Growth Forecasts

According to GlobalData forecasts, the total AI market, including software, hardware, and services, will be worth $1,036.8 billion in 2030, having grown at a compound annual growth rate (CAGR) of 39.1% from $103.0 billion in 2023. The specialized applications category is currently the largest market segment, but AI platforms are the fastest-growing. That said, it is important to understand that a significant proportion of AI hardware revenues and consulting and support services sales are driven by the sale of specialized AI applications, such as computer vision (CV) and conversational platforms.

The global market for specialized AI applications will be worth $512 billion by 2030

Specialized AI applications pull through both AI hardware and consulting and support services.



Source: GlobalData

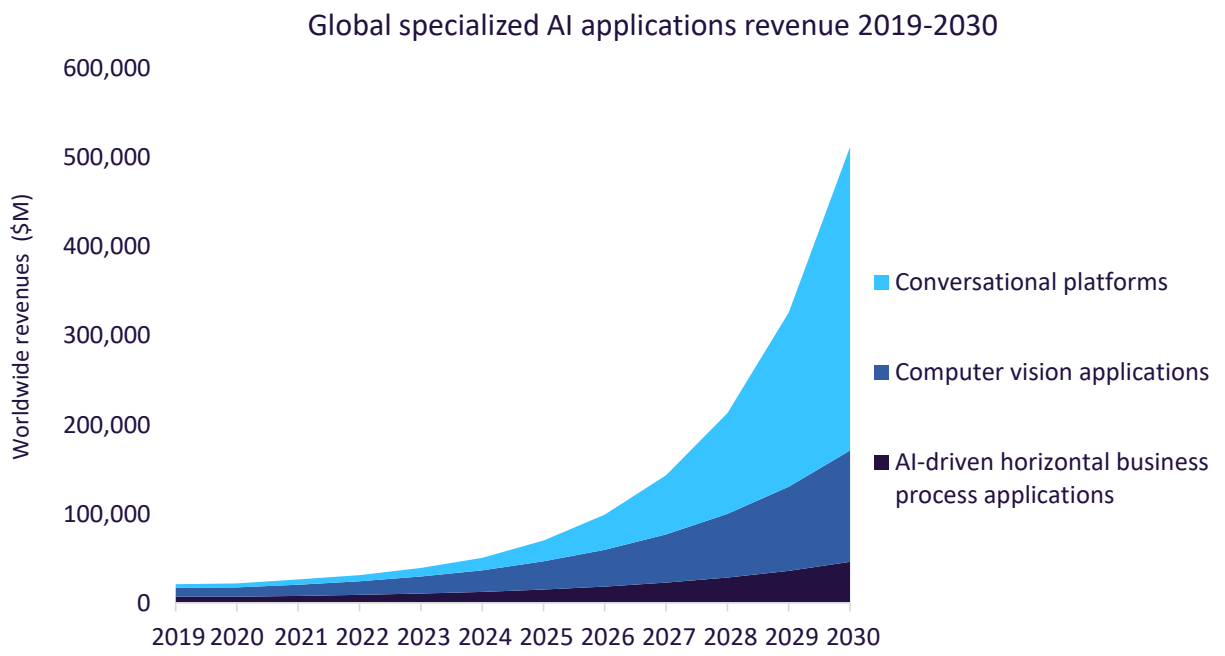
From a product or service perspective, the global specialized AI applications market will be worth $512.1 billion in 2030, growing at a CAGR of 44.3% from $39.3 billion in 2023. GlobalData breaks down its forecasts for this market into specific sub-categories, including conversational platforms, CV, and horizontal applications embedded with AI-driven features such as image recognition, natural language processing, or sentiment analysis. CV is the largest sub-category, but conversational platforms is the fastest growing, and GlobalData forecasts its contribution to exceed CV's by 2027.

The global CV market will be worth $125.1 billion in 2030, up from $19.0 billion in 2023 at a CAGR of 30.9%. Several factors will drive this growth. Firstly, the huge number of digital images available will enable the extraction of ever more meaningful information from visual data, leading to the increased sophistication of CV algorithms. Countless images and videos from the built-in cameras of mobile devices, alongside visual data collected by fixed cameras and even drones, will be used to train algorithms and deliver a higher level of recognition. Secondly, end-user demand across different industries—such as smart cities, healthcare, transport, and retail—will fuel growth.

The global conversational platforms market will be worth $340.8 billion in 2030, up from $9.6 billion in 2023 at a CAGR of 66.4%. This growth will partly be driven by the significant improvement in language models since the release of GPT-3 by OpenAI in 2020, which has broadened the capabilities and applications of conversational platforms.

The global specialized AI applications market will grow at a CAGR of 44%

CV applications and conversational platforms will drive demand for AI hardware, including AI chips



Source: GlobalData

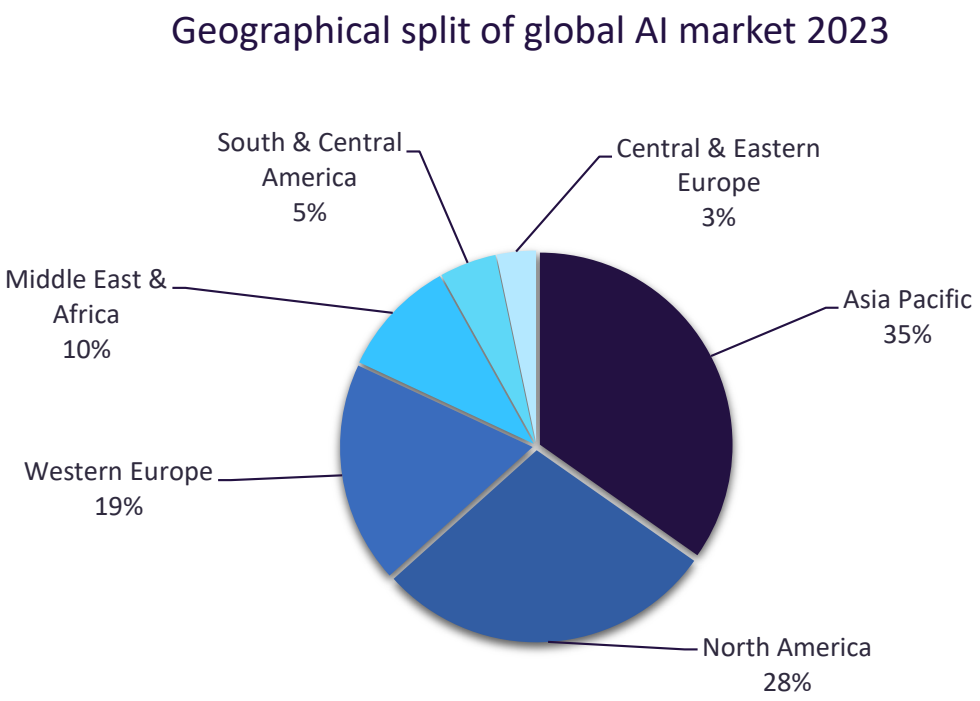
The rapid growth in the volume of data is prompting demand for computing resources to analyze that data. AI applications will be boosted by the increased availability of AI chips capable of handling more complex processing, including cloud-based graphics processing units (GPUs) and custom AI accelerators based on application-specific integrated circuits (ASICs). These chips will be developed by established suppliers like Nvidia, AMD, and Intel, and by the other tech giants, which are increasingly designing their own. For example, in 2018, Alibaba entered the semiconductor industry by launching its PingTouGe subsidiary, which develops computer chips specifically designed for AI. Alibaba now uses its Yitian chips in its cloud business. Likewise, Baidu has been designing its own chips, branded Kunlun, since 2018, and in 2021, it also spun off its semiconductor design business. Alphabet, Amazon, and Microsoft have all developed custom AI accelerators. Finally, advances in convolutional neural networks (CNNs) will also play a major role in developing AI applications, as will the availability of skilled analysts shifting from universities into industries.

From a geographic perspective, North America had a 28% share of 2023 global AI revenues, with the Asia-Pacific region contributing 35%. Given the diverging regulatory posture around data privacy and the use of AI between regions, GlobalData expects Western Europe to lose market share to Asia-Pacific over the next few years.

However, some inhibiting factors will hold back the growth of the global AI market. For one, ethical concerns will result in new regulations, especially of the private use of surveillance technology. In addition, the ongoing trade dispute between the US and China will likely impact technological progress and adoption.

North America and Asia-Pacific are the leading AI markets

AI regulation is likely to hold back adoption in Western Europe.



Source: GlobalData

AI Timeline

AI is not a new concept. The idea of inanimate objects coming to life as intelligent beings goes back to Greek antiquity. In the first half of the 20th century, science fiction's golden age familiarized the world with the concept of artificially intelligent robots. In 1950, Alan Turing published the seminal paper *Computing Machinery and Intelligence,* in which he considered the question, “Can machines think?”. Six years later, during a conference at Dartmouth College, the term “artificial intelligence” was accepted as the name of the field of study into thinking machines.

The progress of AI has not been linear. There have been two significant periods of reduced funding and interest, known as “AI winters”. The first ran from 1974 to 1980, and the second from 1987 to 1993. Following the end of this second winter, interest slowly picked up, helped by IBM’s chess-playing computer Deep Blue’s landmark 1997 victory over Grandmaster Garry Kasparov. Just over a decade later, Google built the first autonomous car, and OpenAI developed a language model that was able to write original prose with human-like fluency. The current AI boom was underway.

The major milestones in the journey of the AI theme are set out in the timeline below.

The AI story

How did this theme get here, and where is it going?

1642	Pascal invented the first digital calculating machine.
1854	George Boole invented Boolean algebra.
1913	Formal logic was revolutionized in *Principia Mathematica* by Whitehead and Russell.
1948	Von Neumann asserted that a general computer could simulate any effective procedure.
1950	Alan Turing developed the Turing Test to assess a machine's ability to exhibit intelligent (human-like) behavior.
1952	Arthur Samuel wrote the first game-playing program for draughts (checkers).
1956	The Dartmouth Summer Research Project on Artificial Intelligence was held, a foundational event for the field.
1959	John McCarthy and Marvin Minsky founded the MIT AI Lab.
1973	The Lighthill Report, heavily critical of AI research, set back the pace of study of AI in the UK and the US.
1997	World chess champion Garry Kasparov was defeated by IBM’s Deep Blue.
2005	Tivo popularized recommendation technology based on tracking web activity and media usage.
2009	Google started its self-driving car project (later renamed Waymo), building its first autonomous car.
2011	IBM Watson beat human champions in the TV game show *Jeopardy!*
2011	Apple released the iPhone 4S, containing the natural language-based virtual assistant Siri.
2014	Tesla introduced AutoPilot, software that was later upgraded for fully autonomous driving.
2014	Amazon launched the Echo, an intelligent voice-activated speaker that included the Alexa virtual assistant.
2015	Baidu launched Duer, its intelligent assistant.
2016	Google DeepMind's AlphaGo algorithm beat the world Go champion Lee Sedol 4–1.
2017	Google Research team published the Transformer model, ushering in the generative AI revolution.
2017	Libratus, designed by Carnegie Mellon researchers, beat the top four players in no-limit Texas hold ’em poker.
2018	Alibaba's AI model scored better than humans in a Stanford University reading and comprehension test.
2019	The US added four of China's leading AI start-ups to a trade blacklist.
2020	COVID-19 accelerated investments in AI.
2020	OpenAI launched the language model GPT-3, which could write original prose with human-equivalent fluency.
2022	The US banned Nvidia and AMD from selling advanced AI chips, including GPUs, to China.
2030	GlobalData forecasts that spending on AI technology will be more than $1,037 billion.
2035	Fully autonomous vehicles (Level 5) will be available to consumers.
2060	50% probability of full human-level AI, according to a poll of AI experts.
2120	75% probability of full human-level AI, according to a poll of AI experts.

Source: GlobalData

Signals

This section uses the over 180 million signals generated by GlobalData's thematic engine to predict how the AI theme will develop and to identify the likely leaders. These signals are a useful source of competitor intelligence in the AI market.

M&A trends

The COVID-19 pandemic, the resulting supply chain disruption, and the emergence of generative AI as an enterprise-ready technology have accelerated automation and digitalization across all industries. The potential of AI to enable both efficiency improvements and automation caused an upsurge in AI-related M&A activity across all sectors between 2019 and 2023.

Many AI-related acquisitions in the last two years have focused on generative AI and cloud AI infrastructure. Examples of the former include the minority stakes taken by Microsoft and Softbank in OpenAI and by Amazon and Google in Anthropic, and the outright acquisitions of MosaicML by Databricks and Light Year by Meituan. More examples of full acquisitions include the acquisition of Run:AI and Excelero by Nvidia, Paperspace by DigitalOcean, and Databand.ai by IBM.

The key M&A transactions associated with the AI theme since January 2022 are listed in the table below.

Date announced	Acquirer	Target	Value ($M)	Target company description
Aug 2024	SoundHound	Amelia AI	80	Provider of a conversational platform for virtual agents.
Jul 2024	Softbank	Graphcore	600	Provider of AI chips.
May 2024	The9	Kuaijin Shidai	2,216	Operator of unmanned AI retail store platform.
May 2024	DocuSign	Lexion	165	Provider of AI-powered agreement management software.
May 2024	Aareon	Stonal	108	Provider of an AI-powered real estate data management platform.
Apr 2024	Thoma Bravo	Darktrace	5,300	Provider of AI-based cybersecurity software solutions and services.
Mar 2024	Amazon	Anthropic	2,750	Generative AI provider.
Mar 2024	The9	WM Therapeutics	1,409	Developer of AI-based precision medicine platforms for brain diseases.
Mar 2024	Nvidia	Run:AI	700	Provider of GPU orchestration software.
Feb 2024	Veradigm	ScienceIO	140	Provider of AI platforms and foundation models for healthcare.
Dec 2023	Burtech Acquisition[(1)]	Blaize	894	Provider of AI tools, including AI chips, for automotive and edge computing.
Dec 2023	Bayanat AI	Yahsat	2,290	Merger to create Space42, a provider of geospatial and mobility solutions.

Date announced	Acquirer	Target	Value ($M)	Target company description
Dec 2023	Lunit	Volpara Health Technologies	192	Provider of medical software for breast cancer screening using AI.
Dec 2023	LIG Nex1	Ghost Robotics	240	Developer of autonomous quadruped robots.
Oct 2023	Google	Anthropic	2,000	Generative AI provider.
Oct 2023	Nice	LiveVox Holdings	393	Cloud platform for customer engagement with AI capabilities.
Sep 2023	Amazon	Anthropic	4,000	Generative AI provider.
Sep 2023	Softbank	OpenAI	1,000	Generative AI provider.
Aug 2023	Parsons	Sealing Technologies	200	Provider of cybersecurity software and services with AI capabilities.
Aug 2023	AeroVironment	Tomahawk Robotics	120	Developer of AI-enabled control systems for the defense industry.
Jul 2023	DoubleVerify Holdings	Scibids Technology	125	Provider of AI tools around advertisers' programmatic buying of digital campaigns.
Jul 2023	DigitalOcean Holdings	Paperspace	111	Cloud infrastructure provider for AI developers.
Jun 2023	Meituan	Light Year	281	Generative AI provider.
Jun 2023	Databricks	Mosaic ML	1,300	Generative AI platform provider.
Jun 2023	Thomson Reuters	Casetext	650	Developer of an AI-powered assistant for law professionals.
Jun 2023	Kunlun Tech	Singularity AI	160	Generative AI provider.
May 2023	Philips Healthcare	DIA Imaging Analysis	100	Provider of AI ultrasound image examination tools for cardiac image acquisition.
Apr 2023	Rosecliff Acquisition Corp I [(1)]	Spectral AI	170	Provider of predictive AI solutions for medical diagnostics.
Mar 2023	CNH Industrial	Augmenta	110	Developer of AI-based field analyzer solutions.
Mar 2023	The Travelers Companies	Corvus Insurance Holdings	435	Cyber insurance company with a proprietary AI-driven cyber risk platform.

Date announced	Acquirer	Target	Value ($M)	Target company description
Mar 2023	Transcarent	98point6	100	Developer of an AI chatbot to assist medical doctors.
Feb 2023	Vahanna Tech Edge Acquisition I [(1)]	Roadzen	259	Provider of B2B AI solutions to the auto insurance market, primarily to automakers and fleet operators.
Feb 2023	indie Semiconductor	GEO Semiconductor	270	Developer of video-processing chips for automotive cameras.
Feb 2023	Google Cloud Platform	Anthropic	300	Generative AI provider.
Jan 2023	Microsoft	OpenAI	10,000	Generative AI provider.
Jan 2023	BioNTech	InstaDeep	608	AI consulting and services firm.
Dec 2022	Mozilla	Lentil AI	Not disclosed	AI and data analytics company focused on workplace productivity.
Nov 2022	Accenture	Albert	Not disclosed	Consultancy firm providing AI and data solutions.
Nov 2022	Meta	Audio Analytic	Not disclosed	Audio recognition software provider.
Oct 2022	Telus International	WillowTree	1,225	Full-service digital product provider focused on end-user experiences.
Aug 2022	OneMeta AI	Metalanguage	Not disclosed	NLP applications and cognitive services company.
Jun 2022	IBM	Databand.ai	150	Data observability software provider.
Jun 2022	ReliaQuest	Digital Shadows	160	AI-powered threat intelligence and security services platform.
Mar 2022	Intel	Granulate Cloud Solutions	650	Automated optimization software provider.
Mar 2022	NielsenIQ	CiValue	Not disclosed	SaaS vendor that powers loyalty programs using an AI platform.
Mar 2022	Nvidia	Excelero	Not disclosed	High-performance block storage provider for AI and analytics workloads.
Feb 2022	Apple	AI Music Group	Not disclosed	AI-generated music tailored to consumer preferences.

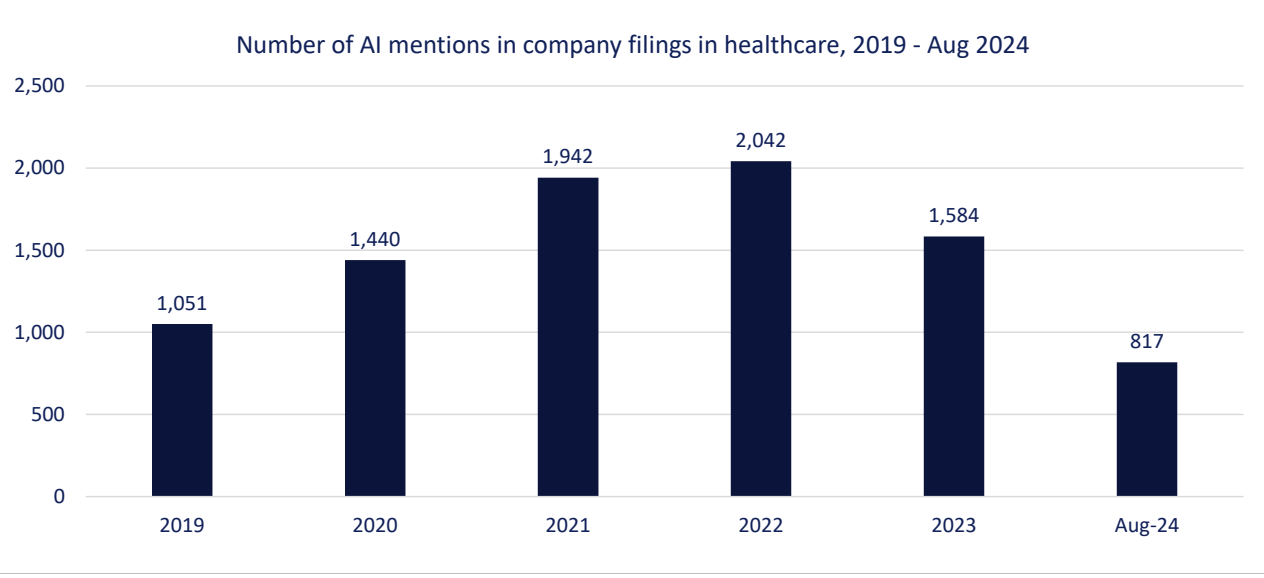
Source: GlobalData
(1) Special purpose acquisition company (SPAC) merger

Company filing trends

The number of AI-related mentions in company filings within the healthcare, pharmaceutical, and medical devices sectors increased by 92% from 2019 to 2022, peaking at 2,042. In 2023, this number fell to 1,584, likely due to global economic uncertainty. The number of mentions is expected to increase through 2024 as companies integrate AI to increase the efficiency and productivity of workflows throughout multiple areas of the healthcare sector.

Mentions of AI by healthcare companies increased from 2019, peaking in 2022 at 2,042

The increased adoption of AI across healthcare ecosystems is reflected in company filings.



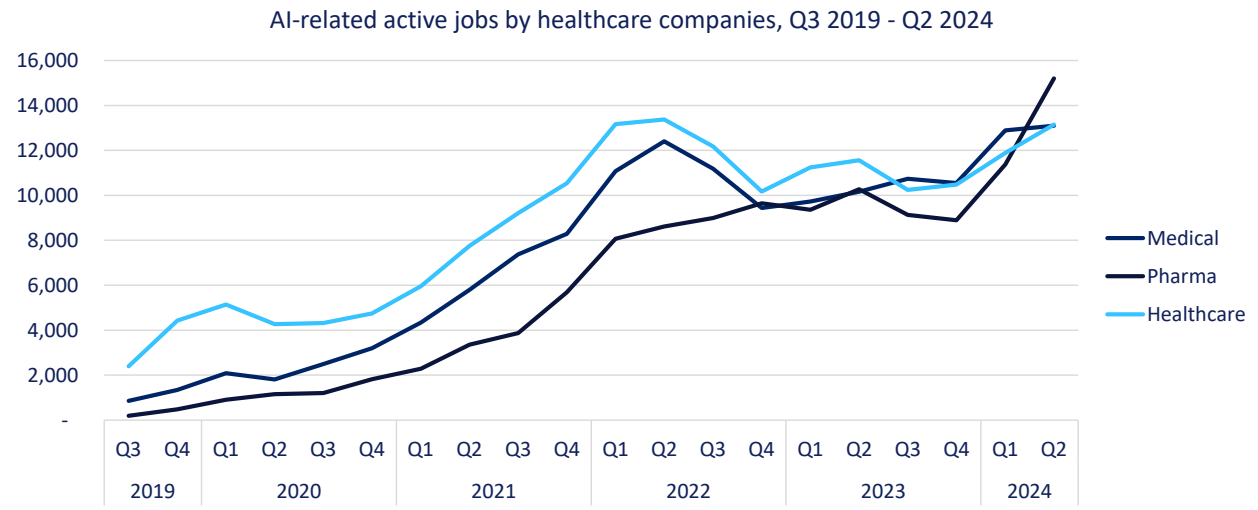
Source: GlobalData

Hiring trends

An analysis of GlobalData's Jobs Analytics shows that the number of AI-related active jobs across pharma, medical devices, and healthcare has increased since 2019, emphasizing the healthcare sector's increased interest in the technology. Even though the COVID-19 pandemic may have slowed recruitment efforts, vacancies continued to increase throughout 2021. The highest numbers of active jobs in medical devices (13,095) and pharma (15,203) were reported in Q2 2024, the most recent quarter with data available, demonstrating consistently increasing interest across both these sectors. The highest number of active jobs in healthcare was reported in Q2 2022 (13,377).

AI-related hiring activity across healthcare has increased since the start of the COVID-19 pandemic

So far in 2024, the pharma sector has experienced the greatest demand for jobs related to AI.

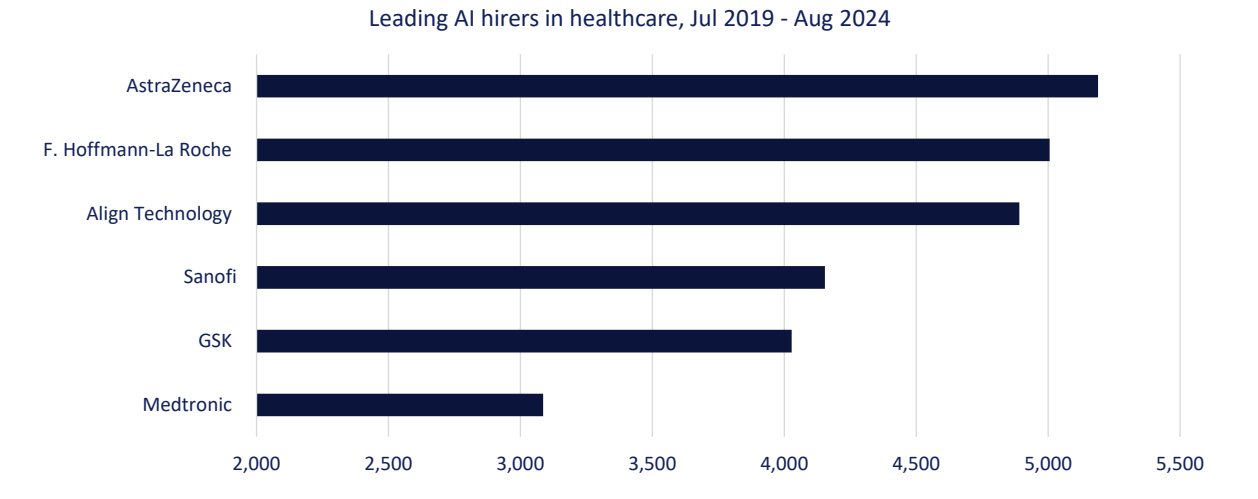


Source: GlobalData

The two largest hirers are pharma companies AstraZeneca and Roche, which have together posted around 10,000 AI jobs since July 2019.

Pharma and medical device companies are active hirers in AI

AstraZeneca is the most actively hiring healthcare company in AI.



Source: GlobalData

Companies

In this section, GlobalData highlights companies making their mark within the AI theme.

Leading AI adopters in healthcare

The table below lists healthcare companies currently deploying AI and summarizes their competitive position in this theme.

Company	Country	Competitive position in the artificial intelligence theme
3M	US	In 2022, 3M launched M*Modal Fluency Direct, an all-in-one speech technology. The platform allows clinicians to capture a complete and accurate patient story. Clinicians can conversationally create, review, edit, and sign clinical notes directly in their EHRs. The platform reduces the administrative burden on healthcare professionals, aiming to make documentation a byproduct of a patient's visit and not a separate, burdensome task for the clinician. In April 2023, 3M partnered with Amazon. 3M uses Amazon's generative AI service to accelerate the conversational AI for the M*Modal platform. The M*Modal platform was first implemented by the University Hospital Southampton (UHS) NHS Foundation Trust in 2021. In April 2023, the hospital reported a significant return on its investment with time and cost savings as typing has been completely replaced by speech recognition.
AstraZeneca	UK	AstraZeneca has partnered with leading AI vendors like BenevolentAI and Illumina since 2019, demonstrating an early interest and competitive advantage when it comes to AI. AstraZeneca's partnership with Illumina aims to apply AI to DNA and other genetic sequencing to increase its success in finding novel drug candidates and biological targets. In December 2022, AstraZeneca Oncology UK partnered with Clinithink to use its AI technology for a project to identify symptomatic and asymptomatic patients in the early stages of lung cancer. In 2024, the project was successfully used by an NHS research team to develop predictive models to flag individuals who could be high-risk and could benefit from lung disease screening. The goal is to provide an opportunity for patients affected to receive earlier treatment.
Bristol Myers Squibb (BMS)	US	BMS has partnered with multiple leading AI vendors to further its drug discovery. In July 2020, BMS collaborated with ReviveMed to use its AI platform to better understand mechanisms of response and resistance to immunotherapies in patients with cancer. Another collaboration was in October 2020 with the ML-driven drug discovery and development company Insitro. The five-year collaboration focuses on discovering and developing novel therapies for treating rare neurological diseases, ALS, and frontotemporal dementia. The same year, BMS collaborated with Sensyne Health to apply ML in rare blood disease research and disease progression within the broader group of myeloproliferative neoplasms. In June 2022, BMS partnered with Owkin to use its AI platform to enhance clinical trial design and execution for cardiovascular drug trials. In March 2023, BMS also partnered with Viz.ai to create a new tool called Viz HCM, designed to spot signs of hypertrophic cardiomyopathy. The tool aims to flag patients showing potential signs of the disease so they can undergo further review and diagnostic testing.

Company	Country	Competitive position in the artificial intelligence theme
GE Healthcare	US	In October 2022, the FDA listed AI-enabled medical devices in the US and revealed that GE Healthcare had 42 authorizations, the highest number from any company. One of those devices is Voluson 22, an AI-powered women's health ultrasound system that provides enhanced image quality and specialized clinical tools to help see anatomical details with higher accuracy and precision. GE's AI strategy also includes Edison Health Services, its software technology that collates patient data for streamlined care and operations. In February 2023, GE acquired Caption Health, which uses AI in ultrasound exams to aid in early disease detection. Indeed, in April 2024, GE Healthcare released an AI-powered software to perform cardiac assessments quickly.
Johnson & Johnson (J&J)	US	J&J's subsidiary Janssen is collaborating with Nference to use AI for drug discovery and development. Janssen is using Nference's AI platform to support identifying and selecting new targets and disease subsets to facilitate competitive therapeutic programs. In April 2020, Janssen initiated a collaboration agreement to use Iktos's AI technology to accelerate small molecule drug discovery. It then announced a strategic collaboration with Tempus, an AI and precision medicine company, to focus on oncology clinical development programs. J&J is also working to embed intelligent automation throughout the company. In March 2024, J&J partnered with Nvidia to further the integration of AI into surgery with the help of Nvidia's AI platform for healthcare. The collaboration aims to broaden AI's use cases in surgery.
Medtronic	Ireland	In March 2023, Medtronic partnered with Nvidia to develop new AI-based solutions for patient care. Medtronic will integrate Nvidia's AI technologies into its GI Genius intelligent endoscopy module, which was developed and manufactured by Cosmo Pharmaceuticals and is the first FDA-approved AI-assisted colonoscopy tool. GI Genius has been designed to host multiple real-time AI applications, transforming gastrointestinal procedures. The module uses AI to highlight abnormalities consistent with polyps, some of which may go undetected by the naked eye, which can cause colorectal cancer. GI Genius is an important tool for the early detection of pre-colorectal cancer. In April 2024, Medtronic launched a Live Stream technology that uses AI algorithms to give surgical insights for robotic-assisted and laparoscopic surgery.
Novartis	Switzerland	One of Novartis's key partnerships was with Microsoft in October 2019 to establish an AI innovation lab. Novartis's data is used with Microsoft's AI solutions to generate models and applications. This collaboration aims to significantly boost Novartis's AI capabilities from research through commercialization and help accelerate the discovery and development of personalized treatments for patients worldwide. In July 2022, Novartis partnered with Anumana to develop AI detection tools for cardiovascular disease. The collaboration aims to develop electrocardiogram (ECG) AI algorithms that will enable clinicians to improve the detection and accelerate intervention of life-threatening heart disease, especially for patients with no prior history. In April 2024, Novartis collaborated with Deciphex to enhance AI in preclinical studies. Specifically, the collaboration aims to use AI tools to conduct pathology evaluations of toxicology and efficacy studies.

Company	Country	Competitive position in the artificial intelligence theme
Pfizer	US	Since 2016, Pfizer has been collaborating with leading AI vendors. Pfizer collaborated with IBM Watson Health in 2016, using its ML technology to help in drug discovery for its immuno-oncology research. Pfizer's oncology team analyzed large volumes of data to test hypotheses and find the combinations most effective at getting the body to fight a tumor. In February 2019, Pfizer entered a collaboration with CytoReason to use ML and its cell-centered models of the immune system for drug discovery and development in Pfizer's core therapeutic areas. Pfizer announced in February 2022 that it had expanded its collaboration with CytoReason for five years. In February 2023, Pfizer announced a multi-year collaboration with Tempus to use its AI-enable platform and extensive data to uncover and gather insights that will advance novel drug discovery and development in oncology. Pfizer will also use Tempus's AI-driven companion diagnostic offerings and clinical trial matching program, TIME, to advance its oncology portfolio. Since 2023, Pfizer has been working on a generative AI platform named Charlie to assist with marketing its products. Along with assisting in content creation, Charlie also aids with fact-checking and legal reviews.
Sanofi	France	In August 2022, Sanofi partnered with Atomwise to use the company's AtomNet platform to research small molecules aimed at up to five drug targets. In October 2022, Sanofi and BioMed X Institute launched a joint research project to create a computational platform to predict the efficacy of drug candidates in virtual patient groups. The team hopes to address the high failure rate of new drug candidates during clinical development, an ongoing barrier the pharmaceutical industry faces. In November 2022, Sanofi began a multi-year strategic research collaboration with AI-based drug development company Insilico Medicine. Through the partnership, Sanofi can use Insilico's AI platform Pharma.AI to develop novel drugs for six new targets, working on key focus areas of cancer, fibrosis, immunity, central nervous system (CNS) diseases, and aging-related diseases. In May 2024, Sanofi, Formation Bio, and OpenAI partnered to use AI software to speed up drug development. Sanofi now has access to proprietary data to build its AI models. This is the first collaboration of its kind in the pharma and bioscience industries.
Zimmer Biomet	US	In 2022, Zimmer Biomet released its WalkAI tool, an AI-based predictive patient mobility analyzer. The tool follows patients recovering from knee or hip surgery in the first few months to predict whether they are recovering at the desired pace. The tool continuously collects information from the patient's iPhone and Apple Watch. The AI algorithm then analyses the mobility data to predict each patient's walking speed at 90 days post-surgery. The WalkAI tool was the orthopedic industry's first AI-based model to predict postoperative outcomes. In July 2022, Zimmer Biomet signed onto a three-year project with Hospital for Special Surgery, a specialist orthopedic surgery based in New York and Florida. The partnership aims to develop new AI-powered support tools for joint replacements. Zimmer Biomet hopes to integrate these decision-based AI tools to work alongside the company's Rosa robots, used for knee and hip procedures.

Source: GlobalData

Specialist AI vendors in healthcare

The table below lists specialist AI vendors in the healthcare sector and summarizes their competitive positions.

Company	Country	Competitive position in the AI theme
AiCure	US	AiCure has an AI platform for clinical trial management. The AiCure app helps to improve medication adherence rates and patient engagement. The app uses facial recognition, allowing patients to take videos of themselves swallowing pills as proof that medication has been taken. The app can identify the correct patients and pills and spot patients at risk of non-adherence. The AiCure platform captures and analyzes behavioral variables to predict participant behavior and response to treatment. In 2023, it received seven new patents in the US, bringing its total to 86.
Anumana	US	Anumana was launched in 2021 by the Mayo Clinic and Nference. The partnership aimed to use the Mayo Clinic's medical data and Nference's AI capabilities to build and market sensor diagnostics focused on heart disease. In May 2022, Anumana received FDA Breakthrough Device Designation for an ECG-based AI algorithm designed for the early detection of pulmonary hypertension. The AI-enabled diagnostic software is designed to detect signals from ECGs that humans cannot interpret.
Atomwise	US	Atomwise uses convolutional neural networks and supercomputers to facilitate the discovery of new medicines. Atomwise patented the first deep learning technology for structure-based small molecule drug discovery. The company's AtomNet AI technology harnesses millions of data points and thousands of protein structures to unlock more undruggable targets than any other AI drug discovery platform. It is researching over 600 unique disease targets across 775 projects with over 250 partners, including leading pharmaceutical, agrochemical, and emerging biotechnology companies. Key partnerships include GC Pharma, Eli Lilly, AbbVie, Pfizer, Bayer, and Charles River Laboratories. In 2018, Atomwise co-founded X-37 with Velocity Pharmaceutical Development, and this company uses Atomwise's AI technology to screen enormous libraries of chemical compounds against high-value targets to find drug candidates. In April 2024, Atomwise released the results of a study that showed that the AtomNet AI platform can discover structurally new chemical matter.
CytoReason	Israel	CytoReason creates computational disease models to accelerate drug development. Proprietary data from pharmaceutical partners and public clinical data is used to simulate human diseases, constructing tissue- and cell-specific models. CytoReason's AI software then explores the disease models. Drug targets can be profiled across disease models to predict how they interact with cells, pathways, and successful treatments, potentially identifying more effective routes for new drug candidates. Differences between patient groups can also be highlighted to identify patients who would benefit most from drugs across different subtypes and stages or patient populations. In July 2024, CytoReason raised $80 million in funding from companies like Nvidia and Pfizer.
Druid AI	Romania	Druid is a virtual assistant tool that aims to improve the patient experience through conversational AI. The tool enables the automation of appointments and review of health status and engagements, saving medical personnel time and contributing to greater client trust. Druid AI is collaborating with Microsoft to enhance its conversational platform.

Company	Country	Competitive position in the AI theme
Insilico Medicine	Hong Kong	Insilico Medicine offers an AI-driven drug discovery platform that identifies novel drug targets for untreated diseases. It focuses on different areas such as cancer, dermatological diseases, fibrosis, Parkinson's disease, Alzheimer's disease, ALS, diabetes, sarcopenia, and aging. Its platform accurately identified potentially new cellular targets for treating IPF and developed a novel drug in less than 18 months. In November 2021, Insilico began the first human trial of its AI-designed drug for IPF. In May 2022, it announced the nomination of a novel preclinical candidate targeting 3C-like protease for treating COVID-19. In 2003, the company initially used its AI platform to identify virus structure and properties during the SARS outbreak. The company then narrowed and identified the 3CL target in the early days of the 2020 pandemic and produced its first novel compound structures designed by its Chemistry42 platform. In 2019, Insilico announced that it had developed GENTRL, a new AI system for drug discovery capable of creating new molecules in 21 days. GENTRL is available as open-source software. In July 2024, Insilico Medicine launched an AI assistant (DORA) for drafting medical research papers, aiming to help life science researchers.
Odin Vision	UK	Odin Vision is a cloud-AI endoscopy company founded by a team of clinicians and AI experts from University College London. The cloud-AI platform has been integrated to assist with clinical endoscopy procedures, supporting doctors in detecting and characterizing polyps, a characteristic of colorectal cancer. AI-assisted colonoscopies reduce misclassification and increase detection rates, reducing cost, time, and risks for patients.
Owkin	US	Owkin is an AI biotechnology company that develops an ML-based model for healthcare, drug discovery, and precision medicine. The platform can interpret omics, visual data, biostatistics, and patient profiles. Owkin has raised over $300 million and became a unicorn in November 2021 through investments from leading biopharma companies including BMS and Sanofi. Through these partnerships, Owkin's AI models discover and rank genes and proteins within the innovative drug target potentials for specific cancers, enhancing drug discovery and development. Owkin technology also powered the blockchain-based Machine Learning Ledger Orchestration for Drug Discovery (MELLODDY), an EU-grant funded project through which Owkin's ML models were allowed to train on the confidential research of 10 top pharma companies, including GSK, AstraZeneca, and Novartis. This project aimed to speed up the discovery and development of new treatments while preserving each company's privacy and control of data.

Source: GlobalData

Sector Scorecards

At GlobalData, we use a scorecard approach to predict tomorrow's leading companies within each sector. Our sector scorecards have three screens: a thematic screen, a valuation screen, and a risk screen.

For a full explanation of thematic scoring, please refer to the methodology section at the back of this report.

Drug development sector scorecard

Who's who

Who does what in the drug development space?

Drug development
(52 companies)

Company	Ticker	Sector	MKT CAP (US$ M)	Country	Description
AbbVie	ABBV	Pharmaceuticals	347,987	USA	Specialty biopharmaceutical company that discovers, develops, manufactures and commercializes drugs for the treatment of chronic and complex diseases.
Amgen	AMGN	Biotechnology	177,663	USA	Biotechnology company that discovers, develops, manufactures and markets innovative therapeutics to treat patients suffering from serious diseases.
Astellas Pharma	4503	Pharmaceuticals	22,268	Japan	Discovers, develops, manufactures, and commercializes a wide range of pharmaceuticals.
AstraZeneca	AZN	Pharmaceuticals	264,846	UK	Biopharmaceutical company that discovers, produces and commercializes a wide range of biologics, prescription pharmaceuticals and vaccines.
Bayer	BAYN	Pharmaceuticals	30,365	Germany	Discovers, develops, manufactures, and commercializes prescription products, specialty pharmaceuticals, diagnostic imaging equipment, and OTC products.
Biocad	Unlisted	Pharmaceuticals	Unlisted	Russia	Biotechnology company that develops, manufactures and distributes generic pharmaceuticals and biosimilars.
Biogen	BIB	Biotechnology	29,853	USA	Biopharmaceutical company that discovers, develops and delivers drugs and biosimilars for the treatment of neurological and neurodegenerative diseases.
Boehringer Sohn	Unlisted	Biolpharmaceutical	Unlisted	Germany	Manufacturer, marketer and supplier of pharmaceutical products and also medicines for animal health.
Bristol Myers Squibb	BMY	Pharmaceuticals	101,289	USA	Specialty biopharmaceutical company that discovers, develops, licenses, manufactures, markets, distributes and sells medicines to patients with serious diseases.
Cadila	Unlisted	Pharmaceuticals	Unlisted	India	Develops, manufactures and distributes pharmaceutical products, including API and pharmaceutical formulations.
Catalent	CTLT	Pharmaceuticals	10,989	USA	Provider of advanced formulation delivery technologies and development solutions for drugs, biologics and consumer health products.
Celltrion	68270	Pharmaceuticals	30,883	Korea	Biopharmaceutical company that focuses on research, development and manufacture of biosimilars and novel biopharmaceuticals.
Charles River	CRL	Pharmaceuticals	9,901	USA	Contract research organization that provides essential products and services to accelerate the research, drug discovery and development.
Cipla	CIPLA	Pharmaceuticals	15,919	India	Pharmaceutical company which manufactures and distributes branded medicines, generics and APIs.
Coherus	CHRS	Pharmaceuticals	151	USA	Biosimilar platform company that develops and commercializes biosimilar drugs.
CSL	CSL	Pharmaceuticals	99,537	Australia	Discovers, develops, manufactures, commercializes, and distributes biopharmaceuticals and related products.
CSPC	1093	Pharmaceuticals	7,376	China	The company manufactures, researches and markets innovative, common generic and bulk medicines and pharmaceutical related products.
Daiichi Sankyo	4568	Pharmaceuticals	78,049	Japan	Company which carries out the research, development, manufacture, and marketing of pharmaceutical products, including prescription drugs, OTC drugs, vaccines, and others.
Dr. Reddy's	DRREDDY	Pharmaceuticals	13,613	India	Pharmaceutical company that manufactures and markets generic formulations, APIs, biosimilars and proprietary products.
Generium	Unlisted	Pharmaceuticals	Unlisted	Russia	Biopharmaceutical company focused on developing and commercializing diagnostic systems and innovative and biosimilar pharmaceutical products, with a focus on orphan diseases.
Gilead Sciences	GILD	Biotechnology	98,516	USA	Biopharmaceutical company focused on the discovery, development and commercialization of medicines.
GSK	GSK	Pharmaceuticals	90,535	UK	Company focused on the development, manufacture and commercialization of pharmaceuticals, vaccines and consumer healthcare products.
Innovent Biologics	1801	Pharmaceuticals	8,973	China	Biopharmaceutical company that discovers, develops and manufactures innovative and biosimilar monoclonal antibodies.
Intas	Unlisted	Pharmaceuticals	Unlisted	India	Develops, manufactures, and markets innovative, generic, and biosimilar pharmaceutical products for the treatment of a wide range of diseases and disorders.
IQVIA	IQV	Pharmaceuticals	45,364	USA	Provider of information, novel technological solutions and contract research services.
Johnson & Johnson	JNJ	Pharmaceuticals	402,876	USA	Researches, develops, manufactures and sells pharmaceutical products, medical devices and consumer products.
Lilly	LLY	Pharmaceuticals	899,397	USA	Company that discovers, develops and markets human healthcare products.
Lonza	LONN	Pharmaceuticals	45,896	Switzerland	Provides contract manufacturing and development solutions to lifescience industry.
Lupin	LUPIN	Pharmaceuticals	12,184	India	Develops and manufactures generic and branded formulations, biotechnology products and APIs.
Merck	MRK	Pharmaceuticals	82,946	Germany	Discovers, develops and manufactures prescription drugs. Also provides lab water systems, gene editing tools, cell lines, antibodies and end-to-end systems.
Merck & Co	MRK	Pharmaceuticals	293,531	USA	Biopharmaceutical company that discovers, develops, manufactures and commercializes prescription medicines, biologic therapies, vaccines and animal health products.
Novartis	NOVN	Pharmaceuticals	258,878	Switzerland	Healthcare company that focuses on the discovery, development, manufacture and marketing of prescription and generic pharmaceutical products and eye care products.
Novo Nordisk	NOVO B	Pharmaceuticals	454,357	Denmark	Biopharmaceutical company that discovers, develops and manufactures innovative biological medicines.
Otsuka	4768	Pharmaceuticals	9,095	Japan	Portfolio includes pharmaceuticals, cosmetics, functional foods and beverages, alcoholic beverages, fine chemicals, electronic equipment, functional chemicals, medical devices and OTC products.
Parexel	Unlisted	Pharmaceuticals	Unlisted	USA	A biopharmaceutical outsourcing service company providing services for managing the biopharmaceutical product lifecycle and for the development and commercialization of new medical therapies.
Perrigo	PRGO	Pharmaceuticals	3,886	Ireland	Develops, manufactures and distributes OTC products, generic and prescription pharmaceuticals, specialty pharmaceutical company, nutritional products, and infant formulas and foods.
Pfizer	PFE	Pharmaceuticals	160,878	USA	Discovers, develops, manufactures and commercializes biopharmaceuticals and generic and branded pharmaceuticals.
Regeneron	REGN	Biotechnology	130,007	USA	Discovers, develops, manufactures, and markets medicines for the treatment of serious medical conditions.
Reliance Industries	RELIANCE	Exploration & Production	243,492	India	Manufacturer of petrochemicals and synthetic fibres, producer of gasoline and other products
Roche	ROG	Medical Supplies	267,534	Switzerland	Biotechnology company that develops drugs and diagnostics to treat major diseases.
Samsung Biologics	207940	Pharmaceuticals	50,376	Korea	Division of Samsung Group that provides contract development and manufacturing services. Subsidiary Samsung Bioepis is a biosimilars leader.
Sanofi	SAN	Pharmaceuticals	148,404	France	Company that discovers, develops, manufactures and markets a wide range of medicines and vaccines.
Shanghai Henlius Biotech	2696	Pharmaceuticals	1,617	China	The company is focused on developing high-levelled mAb-based therapeutics, including mAb biosimilar, biobetters, bispecific antibody drugs, and antibody-drug conjugates among others.
Sun Pharma	SUNPHARMA	Pharmaceuticals	51,825	India	Specialty pharmaceutical company that offers a wide range of pharmaceutical formulations such as branded generics and generic pharmaceuticals.
Takeda	4502	Pharmaceuticals	47,164	Japan	Pharmaceutical company which focuses on the discovery, development, manufacturing, marketing, commercialization, import and export of pharmaceutical drugs.
Teva	TEVA	Pharmaceuticals	21,798	Israel	Discovers, develops, manufactures and commercializes generic and specialty medicines.
Thermo Fisher Scientific	TMO	Medical Equipment	233,743	USA	Develop therapeutic and diagnostic medical products for heart and movement conditions
UCB	UCB	Pharmaceuticals	35,404	Belgium	Biopharmaceutical company that discovers and develops novel medicines and solutions to help treat various diseases.
Vertex	VRTX	Biotechnology	123,520	USA	Biotechnology company that discovers, develops and commercializes transformative drugs for the treatment of serious and life-threatening diseases.
Viatris	VTRS	Pharmaceuticals	14,060	USA	Pharmaceutical company which develops, licenses, manufactures, markets and distributes generics and branded medicines, and consumer healthcare products.
WuXi AppTec	603259	Pharmaceuticals	15,771	China	Provides drug discovery, laboratory and regulatory services, small molecule drug development, testing and R&D services, and manufacturing services for advanced intermediates and APIs.
Zydus Lifesciences	ZYDUSLIFE	Pharmaceuticals	13,366	India	The company's product portfolio includes APIs, formulations, and wellness products. It also conducts research to develop biologics, vaccines and new chemical entities.

Source: GlobalData

Thematic screen

Our thematic screen ranks companies based on overall leadership in the 10 themes that matter most to their industry, generating a leading indicator of future performance.

Drug development (52 companies)				Weighting	Thematic Screen										
					15%	15%	10%	10%	15%	10%	5%	5%	10%	5%	100%
Company	MKT CAP (US$ M)	Ticker	Country		Immuno-Oncology	Precision and Personalized Medicine	Regenerative Medicine	Rare Diseases	Biosimilars	Genomics	Artificial Intelligence	Deal Making	Supply Chain Management	Cybersecurity	Thematic Ranking
Pfizer	160,878	PFE	USA		5	5	4	5	5	5	5	5	5	5	1
Thermo Fisher Scientific	233,743	TMO	USA		4	5	5	5	5	5	5	5	5	3	2
Catalent	10,989	CTLT	USA		5	5	5	5	5	5	2	4	5	4	3
Novartis	258,878	NOVN	Switzerland		5	5	5	5	3	5	5	5	5	5	4
Sanofi	148,404	SAN	France		5	4	4	5	5	5	5	5	5	4	5
Johnson & Johnson	402,876	JNJ	USA		5	5	4	5	5	4	5	4	4	4	6
Merck & Co	293,531	MRK	USA		5	5	4	5	3	4	5	5	5	5	7
AstraZeneca	264,846	AZN	UK		5	5	5	5	2	5	5	5	5	4	8
Amgen	177,663	AMGN	USA		4	5	3	5	5	5	4	5	4	5	9
Lonza	45,896	LONN	Switzerland		5	5	5	4	4	4	3	4	5	5	10
IQVIA	45,364	IQV	USA		5	5	3	4	5	4	5	4	5	4	11
Roche	267,534	ROG	Switzerland		5	5	4	5	3	5	5	5	4	4	12
Parexel	Unlisted	Unlisted	USA		5	5	2	5	5	3	3	5	5	4	13
Bristol Myers Squibb	101,289	BMY	USA		5	5	5	5	2	4	5	5	4	4	14
Gilead Sciences	98,516	GILD	USA		5	5	5	5	2	4	4	4	4	4	15
Biogen	29,853	BIIB	USA		4	4	3	4	4	5	3	5	4	5	16
GSK	90,535	GSK	UK		4	4	4	5	1	5	5	5	5	5	17
AbbVie	347,987	ABBV	USA		4	5	3	5	3	4	3	4	4	4	18
Merck	82,946	MRK	Germany		4	4	4	4	4	3	5	4	4	4	19
Takeda	47,164	4502	Japan		4	5	4	5	1	4	5	4	5	4	20
Lilly	899,397	LLY	USA		4	5	3	5	2	4	3	5	4	5	21
Astellas Pharma	22,268	4503	Japan		4	4	5	5	1	5	4	5	4	4	22
Daiichi Sankyo	78,049	4568	Japan		3	4	4	5	4	3	4	5	4	3	23
WuXi AppTec	15,771	603259	China		3	4	4	3	4	4	4	4	5	3	24
Charles River	9,901	CRL	USA		3	4	4	4	3	4	4	4	5	4	25
Boehringer Sohn	Unlisted	Unlisted	Germany		4	5	2	4	3	4	4	4	4	4	26
Novo Nordisk	454,357	NOVO B	Denmark		3	4	4	5	2	4	4	5	4	4	27
Bayer	30,365	BAYN	Germany		3	4	4	4	2	4	5	5	4	5	28
Vertex	123,520	VRTX	USA		3	4	5	5	1	4	3	5	4	4	29
Samsung Biologics	50,376	207940	Korea		4	4	1	4	5	3	3	4	3	3	30
Cipla	15,919	CIPLA	India		2	5	4	3	5	3	3	3	3	3	31
Regeneron	130,007	REGN	USA		4	4	4	4	1	4	2	4	3	3	32
Dr. Reddy's	13,613	DRREDDY	India		3	3	3	3	4	3	3	4	4	3	33
Innovent Biologics	8,973	1801	China		4	4	3	4	5	2	1	4	1	2	34
Shanghai Henlius Biotech	1,617	2696	China		4	4	1	4	5	1	2	4	3	3	35
Teva	21,798	TEVA	Israel		2	3	1	3	5	2	4	3	5	4	36
CSL	99,537	CSL	Australia		2	3	2	4	3	4	3	4	3	4	37
Celltrion	30,883	68270	Korea		3	4	1	4	5	1	2	4	3	1	38
Lupin	12,184	LUPIN	India		2	3	1	4	5	3	3	3	3	3	39
Intas	Unlisted	Unlisted	India		3	4	1	4	5	1	1	3	3	3	40
Viatris	14,060	VTRS	USA		2	4	1	3	4	2	3	4	4	3	41
UCB	35,404	UCB	Belgium		2	3	2	4	2	3	4	4	4	4	42
Sun Pharma	51,825	SUNPHARMA	India		3	3	1	4	3	3	2	3	4	2	43
Reliance Industries	243,492	RELIANCE	India		2	3	4	3	4	1	3	2	2	4	44
Zydus Lifesciences	13,366	ZYDUSLIFE	India		2	3	1	3	4	3	1	3	4	3	45
Biocad	Unlisted	Unlisted	Russia		3	3	1	3	4	2	2	3	3	3	46
Otsuka	9,095	4768	Japan		4	3	3	3	1	2	3	2	3	4	47
CSPC	7,376	1093	China		3	3	1	4	3	4	1	2	2	2	48
Coherus	151	CHRS	USA		4	3	1	3	4	1	1	3	2	3	49
Generium	Unlisted	Unlisted	Russia		2	3	1	2	5	3	1	2	2	1	50
Cadila	Unlisted	Unlisted	India		1	3	1	3	3	3	1	2	2	1	51
Perrigo	3,886	PRGO	Ireland		2	1	1	4	1	1	2	4	3	4	52

Key: 1 (red) implies this theme will have a negative impact on earnings over the next 12 months; 3 (amber) implies a neutral impact; and 5 (green) a positive impact. See the methodology section at the back of this report for an explanation of our research methodology.

Source: GlobalData

Valuation screen

Our valuation screen ranks our universe of companies within a sector based on selected valuation metrics.

Drug development (52 companies)				Valuation Screen					
			Weighting	25%	20%	15%	20%	20%	100%
Company	MKT CAP (US$ M)	Ticker	Country	EV/EBITDA	EV/Sales	Div yield %	Net Debt (Cash)/ Market Value %	FCF yield %	Valuation Ranking
CSPC	7,376	1093	China	4.9	1.3	5.2	-32.5	4.4	1
WuXi AppTec	15,771	603259	China	8.8	2.6	2.5	-16.9	7.0	2
Otsuka	9,095	4768	Japan	15.8	1.1	1.8	-18.6	4.6	3
Bayer	30,365	BAYN	Germany	5.6	1.3	8.7	113.0	8.6	4
Bristol Myers Squibb	101,289	BMY	USA	6.7	2.9	4.7	25.1	12.5	5
Viatris	14,060	VTRS	USA	8.9	2.0	4.1	120.1	16.5	6
Sanofi	148,404	SAN	France	11.3	3.1	3.3	5.1	5.4	7
GSK	90,535	GSK	UK	9.0	2.7	3.3	17.2	6.4	8
Gilead Sciences	98,516	GILD	USA	11.3	4.3	3.9	16.8	7.5	9
Perrigo	3,886	PRGO	Ireland	14.0	1.5	3.9	83.9	7.8	10
Roche	267,534	ROG	Switzerland	13.5	4.3	3.5	8.6	5.0	11
Johnson & Johnson	402,876	JNJ	USA	18.2	4.8	2.9	0.5	4.5	12
Takeda	47,164	4502	Japan	11.5	2.6	4.2	57.2	3.4	13
Novartis	258,878	NOVN	Switzerland	15.2	5.8	2.8	4.0	4.5	14
Dr. Reddy's	13,613	DRREDDY	India	13.6	3.9	0.6	-5.9	1.6	15
Astellas Pharma	22,268	4503	Japan	21.4	2.4	3.6	17.0	2.8	16
Reliance Industries	243,492	RELIANCE	India	14.2	2.5	0.3	0.8	0.3	17
AbbVie	347,987	ABBV	USA	18.4	7.3	3.0	13.3	6.3	18
Cipla	15,919	CIPLA	India	20.7	4.9	0.5	-6.4	2.1	19
Charles River	9,901	CRL	USA	11.7	3.0		21.5	3.7	20
Merck	82,946	MRK	Germany	15.1	4.0	0.4	10.4	2.4	21
Daiichi Sankyo	78,049	4568	Japan	38.6	6.7	0.6	-7.6	4.1	22
Biogen	29,853	BIIB	USA	17.0	3.6		17.2	4.1	23
Zydus Lifesciences	13,366	ZYDUSLIFE	India	21.5	5.8	0.6	-1.4	2.1	24
Pfizer	160,878	PFE	USA	41.1	3.8	5.7	27.2	3.0	25
AstraZeneca	264,846	AZN	UK	21.2	6.3	1.7	7.9	2.5	26
Amgen	177,663	AMGN	USA	19.0	8.2	2.6	30.1	4.1	27
Lupin	12,184	LUPIN	India	27.1	5.2	0.2	0.6	2.7	28
Merck & Co	293,531	MRK	USA	56.9	5.3	2.5	9.0	3.1	29
Teva	21,798	TEVA	Israel	24.6	2.5		76.2	3.9	30
IQVIA	45,364	IQV	USA	18.7	3.9		26.8	3.3	31
Sun Pharma	51,825	SUNPHARMA	India	33.6	8.7	0.7	-5.1	2.3	32
Thermo Fisher Scientific	233,743	TMO	USA	25.4	6.1	0.2	11.5	3.0	33
Shanghai Henlius Biotech	1,617	2696	China	14.0	2.7		27.1	0.3	34
Novo Nordisk	454,357	NOVO B	Denmark	27.4	13.2	1.0	-0.1	2.3	35
UCB	35,404	UCB	Belgium	26.2	6.5	0.8	5.7	1.4	36
CSL	99,537	CSL	Australia	23.6	7.6	1.2	10.4	1.5	37
Regeneron	130,007	REGN	USA	27.3	9.3		-10.5	2.8	38
Lonza	45,896	LONN	Switzerland	27.0	6.0	0.7	3.5	-0.8	39
Vertex	123,520	VRTX	USA	28.1	11.4		-10.8	2.7	40
Celltrion	30,883	68270	Korea	47.7	19.6	0.1	2.5	0.4	41
Samsung Biologics	50,376	207940	Korea	41.8	18.2		-0.2	0.8	42
Lilly	899,397	LLY	USA	115.4	27.0	0.5	2.1	-0.4	43
Innovent Biologics	8,973	1801	China	-86.5	9.2		-11.5	-1.9	44
Coherus	151	CHRS	USA	-2.5	2.0		236.3	-116.1	45
Catalent	10,989	CTLT	USA	-20.8	3.6		42.0	-0.5	46
Biocad	Unlisted	Unlisted	Russia						47
Boehringer Sohn	Unlisted	Unlisted	Germany						48
Cadila	Unlisted	Unlisted	India						49
Generium	Unlisted	Unlisted	Russia						50
Intas	Unlisted	Unlisted	India						51
Parexel	Unlisted	Unlisted	USA						52
Median				15.5	3.9	0.6	4.5	2.7	
Mean				17.0	5.2	1.6	17.8	0.9	

Key: Green denotes that the company is cheap (15% more attractively priced than the median value for the sector) relative to its global peers; amber denotes it is within 15% of the sector median value; and red denotes that it is expensive relative to its global peers. Private companies are shown at the bottom of these rankings by default because they do not have a publicly listed market price. See the methodology section at the back of this report for an explanation of our research methodology.

Source: GlobalData

Risk screen

Our risk screen ranks companies within a particular sector based on overall investment risk.

Drug development (52 companies)				Risk Screen				
			Weighting	40%	30%	15%	15%	100%
Company	MKT CAP (US$ M)	Ticker	Country	Operational Risk	Financial Risk	Industry Risk	Country Risk	Risk Ranking
Vertex	123,520	VRTX	USA	4	4	4	5	1
Regeneron	130,007	REGN	USA	4	4	4	5	2
WuXi AppTec	15,771	603259	China	4	3	4	5	3
Charles River	9,901	CRL	USA	4	3	4	5	4
Roche	267,534	ROG	Switzerland	4	3	4	5	5
CSPC	7,376	1093	China	3	4	3	4	6
Johnson & Johnson	402,876	JNJ	USA	4	3	4	4	7
Lonza	45,896	LONN	Switzerland	4	3	4	4	8
Parexel	Unlisted	Unlisted	USA	3	4	5	5	9
Otsuka	9,095	4768	Japan	3	4	3	5	10
Novo Nordisk	454,357	NOVO B	Denmark	4	4	4	4	11
Biogen	29,853	BIIB	USA	4	3	4	5	12
Astellas Pharma	22,268	4503	Japan	3	4	4	4	13
Daiichi Sankyo	78,049	4568	Japan	3	4	4	5	14
Celltrion	30,883	68270	Korea	3	3	4	5	15
Thermo Fisher Scientific	233,743	TMO	USA	4	3	4	4	16
Bristol Myers Squibb	101,289	BMY	USA	4	3	4	5	17
Gilead Sciences	98,516	GILD	USA	4	3	4	5	18
AbbVie	347,987	ABBV	USA	4	2	4	5	19
Novartis	258,878	NOVN	Switzerland	4	3	4	4	20
Lilly	899,397	LLY	USA	4	3	4	5	21
Coherus	151	CHRS	USA	3	3	4	5	22
Sanofi	148,404	SAN	France	3	3	4	4	23
Pfizer	160,878	PFE	USA	4	2	4	4	24
Merck & Co	293,531	MRK	USA	4	2	4	4	25
Boehringer Sohn	Unlisted	Unlisted	Germany	3	3	4	5	26
Dr. Reddy's	13,613	DRREDDY	India	3	3	4	4	27
CSL	99,537	CSL	Australia	3	3	4	4	28
Amgen	177,663	AMGN	USA	4	2	4	4	29
Zydus Lifesciences	13,366	ZYDUSLIFE	India	3	3	4	4	30
Sun Pharma	51,825	SUNPHARMA	India	3	3	4	4	31
UCB	35,404	UCB	Belgium	3	3	4	4	32
Cipla	15,919	CIPLA	India	3	3	4	3	33
Merck	82,946	MRK	Germany	3	2	4	4	34
Innovent Biologics	8,973	1801	China	3	2	4	4	35
Catalent	10,989	CTLT	USA	3	2	4	5	36
Reliance Industries	243,492	RELIANCE	India	4	2	3	3	37
GSK	90,535	GSK	UK	3	2	3	4	38
AstraZeneca	264,846	AZN	UK	3	2	4	4	39
Lupin	12,184	LUPIN	India	3	2	4	4	40
Bayer	30,365	BAYN	Germany	3	2	3	4	41
Viatris	14,060	VTRS	USA	3	2	4	5	42
Cadila	Unlisted	Unlisted	India	3	3	4	3	43
Shanghai Henlius Biotech	1,617	2696	China	3	2	4	4	44
Biocad	Unlisted	Unlisted	Russia	3	3	4	2	45
Teva	21,798	TEVA	Israel	3	2	4	4	46
Takeda	47,164	4502	Japan	3	2	4	5	47
Perrigo	3,886	PRGO	Ireland	3	2	4	5	48
Intas	Unlisted	Unlisted	India	3	3	4	3	49
IQVIA	45,364	IQV	USA	4	2	3	3	50
Samsung Biologics	50,376	207940	Korea	2	2	4	5	51
Generium	Unlisted	Unlisted	Russia	3	3	4	2	52

Key: Green denotes low risk; amber denotes medium risk; red denotes high risk. See the methodology section at the back of this report for an explanation of our research methodology.

Source: GlobalData

Medical devices sector scorecard

Who's who

Who does what in the medical devices space?

Medical Devices
(34 companies)

Company	Ticker	Sector	MKT CAP (US$ M)	Country	Description
3M	MMM	Medical Equipment	72,597	USA	Technology company that creates electronic devices and products
Abbott	ABT	Medical Equipment	199,044	USA	Designs, manufactures and markets medical products relational to orthopedic and surgical products
Agilent Tech	A	Measurement equipment	39,697	USA	Manufacturer of bioanalytical and measurement systems
Alphabet	GOOGL	Internet ecosystems	1,933,495	USA	Internet ecosystem monetised by advertising, primarily through the Google search engine
Apple	AAPL	Mobile phones	3,357,834	USA	Internet ecosystem monetised by the sale of proprietary hardware (smartphones and computers)
Baxter	BAX	Medical Supplies	19,147	USA	Offers diagnostic services for human infusion, respiratory therapies, ultrasound and echo cardiography
Becton Dickinson	BDX	Medical Equipment	68,312	USA	Manufactures eyecare products
Biotronik	Unlisted	Medical equipment	Unlisted	Germany	Biomedical technology company
Boston Scientific	BSX	Medical Equipment	120,696	USA	Provide medical tech for imaging, lab diagnostics and reading solutions for health care applications
Coloplast	COLO B	Medical Supplies	28,710	Denmark	Provides diagnostic, detection and information systems for veterinary food and water testing applications
Danaher	DHR	Industrial conglomerate	191,018	USA	Manufacturer of medical, professional, commercial and industrial products.
DexCom	DXCM	Medical Supplies	27,979	USA	Develops and markets advanced medical devices such as orthopaedics, endoscopy and wound management
Edwards Lifesciences	EW	Medical Supplies	41,523	USA	Develops, manufactures and markets products for chronic acute medical conditions
Garmin	GRMN	Wearable tech	34,777	Switzerland	Manufacturer of navigation and comms devices - esp. GPS
GE HealthCare	GEHC	MedTech	39,981	USA	Medical technology company spun off from General Electric in 2023
Getinge	GETI B	Medical Equipment	5,357	Sweden	Produces and sells medical products for the treatment of neurological disorders
Illumina	ILMN	MedTech	20,484	USA	Manufacturer of life science equipment used for gene sequencing
Intuitive Surgical	ISRG	Surgical robots	170,872	USA	Manufacturer of surgical robotic systems
Johnson & Johnson	JNJ	Pharmaceuticals	402,876	USA	Researches, develops, manufactures and sells pharmaceutical products, medical devices and consumer products.
Medtronic	MDT	MedTech	116,745	Ireland	Developer of therapeutic and diagnostic medical products
MicroPort	853	Medical equipment	1,082	China	Medical device developer and manufacturer
Nihon Kohden	6849	Medical Equipment	2,252	Japan	Develops, manufactures and sells medical equipment
Omron	6645	Robotic components	8,197	Japan	Manufacturer of electronic components, equipment and systems used for factory automation.
Philips	PHIA	MedTech	28,135	Netherlands	Manufacturer of medical systems and lighting products (sold its TV and consumer businesses in 2013)
Qiagen	QIA	Medical Supplies	9,888	Netherlands	Global provider of sample to insight solutions to transform biological materials into valuable molecular sights
Quest Diagnostics	DGX	Medical Equipment	17,298	USA	Provider of diagnostic information services to patients and physicians
Roche	ROG	Medical Supplies	267,534	Switzerland	Biotechnology company that develops drugs and diagnostics to treat major diseases.
Siemens Healthineers	SHL	Health Care Providers	64,003	Germany	Provider of medical solutions
Smith & Nephew	SN.	Medical Equipment	13,333	UK	Develops, produces and sells personal care products
Stryker	SYK	Surgical robots	137,256	USA	Manufacturer of robotic orthopedic solutions
Teleflex	TFX	Medical Supplies	11,542	USA	Develops, produces and sells dental implants that are implantable in the jaw
Terumo	4543	Medical Equipment	27,262	Japan	Manufactures products for ostomy, incontinence, mastectomy, wound healing and skin care
Thermo Fisher Scientific	TMO	Medical Equipment	233,743	USA	Develop therapeutic and diagnostic medical products for heart and movement conditions
Zimmer Biomet	ZBH	Medical Equipment	23,314	USA	Develop, manufacture and market specialty surgical products including navigation

Source: GlobalData

Thematic screen

Our thematic screen ranks companies based on overall leadership in the 10 themes that matter most to their industry, generating a leading indicator of future performance.

Medical Devices
(34 companies)

Company	MKT CAP (US$ M)	Ticker	Country	Weighting	20% Artificial Intelligence	10% Wearable Tech	10% Cybersecurity	5% Mobile Health	10% Remote Patient Monitoring	15% Internet of Things	5% ESG	10% Digital Health	10% Cloud	5% India Impact	100% Thematic Ranking
					Thematic Screen										
Medtronic	113,603	MDT	Ireland		5	4	4	5	5	5	4	5	3	4	1
Roche	277,627	ROG	Switzerland		5	4	4	4	4	5	5	4	5	3	2
Johnson & Johnson	399,265	JNJ	USA		5	4	4	4	4	5	4	4	5	3	3
Abbott	197,078	ABT	USA		4	5	3	5	5	5	3	5	4	5	4
Apple	3,481,747	AAPL	USA		5	4	4	5	5	5	2	4	4	3	5
GE HealthCare	38,734	GEHC	USA		5	4	3	3	5	4	5	4	5	5	6
Philips	28,254	PHIA	Netherlands		5	3	4	4	5	4	4	4	5	5	7
Alphabet	2,020,870	GOOGL	USA		5	4	5	5	4	2	3	4	5	4	8
Siemens Healthineers	65,520	SHL	Germany		4	3	3	4	4	5	3	4	5	5	9
DexCom	27,786	DXCM	USA		4	4	3	5	5	5	3	4	4	2	10
3M	73,992	MMM	USA		5	4	3	4	3	3	5	3	5	5	11
Baxter	19,356	BAX	USA		4	4	3	4	5	5	3	3	4	3	12
Boston Scientific	120,446	BSX	USA		4	4	3	4	4	4	3	4	4	3	13
Garmin	35,231	GRMN	Switzerland		4	5	2	4	4	4	3	3	4	4	14
Intuitive Surgical	174,739	ISRG	USA		4	3	3	3	3	4	3	4	5	3	15
Illumina	20,932	ILMN	USA		5	3	3	3	3	3	3	3	5	4	16
Omron	8,609	6645	Japan		4	3	2	4	5	5	3	4	2	3	17
Thermo Fisher Scientific	234,954	TMO	USA		5	2	3	3	3	4	3	3	4	4	18
Becton Dickinson	70,067	BDX	USA		4	4	3	1	4	4	3	3	5	2	19
Stryker	137,302	SYK	USA		4	4	3	2	3	4	2	4	4	3	20
Nihon Kohden	2,322	6849	Japan		4	4	3	2	4	4	3	3	3	4	21
Biotronik	Unlisted	Unlisted	Germany		4	4	2	4	4	5	3	4	1	3	22
Zimmer Biomet	23,514	ZBH	USA		4	4	1	4	5	3	3	4	3	2	23
Smith & Nephew	13,562	SN.	UK		4	4	3	3	3	2	3	4	2	4	24
Qiagen	10,235	QIA	Netherlands		4	3	2	3	3	3	3	3	4	2	25
Agilent Tech	41,094	A	USA		4	3	3	3	3	3	3	2	3	3	26
Danaher	194,499	DHR	USA		3	2	3	3	3	3	3	2	3	4	27
Quest Diagnostics	17,473	DGX	USA		4	3	1	2	3	3	4	2	3	2	28
Getinge	5,290	GETI B	Sweden		2	2	1	2	2	5	3	3	4	3	29
Edwards Lifesciences	42,144	EW	USA		2	3	2	2	2	4	4	2	3	4	30
Teleflex	11,552	TFX	USA		1	3	3	1	3	3	3	3	2	4	31
Coloplast	28,654	COLO B	Denmark		1	3	1	3	3	3	4	2	2	4	32
MicroPort	1,162	853	China		1	3	1	1	2	4	3	3	2	3	33
Terumo	27,771	4543	Japan		2	3	1	1	2	3	3	2	2	3	34

Thematic leader

Thematic laggard

Key: 1 (red) implies this theme will have a negative impact on earnings over the next 12 months; 3 (amber) implies a neutral impact; and 5 (green) a positive impact. See the methodology section at the back of this report for an explanation of our research methodology.

Source: GlobalData

Valuation screen

Our valuation screen ranks our universe of companies within a sector based on selected valuation metrics.

Medical Devices (34 companies)				Valuation Screen					
			Weighting	25%	20%	15%	20%	20%	100%
Company	MKT CAP (US$ M)	Ticker	Country	EV/Sales	P/E	Net margin %	P/Book	FCF yield %	Valuation Ranking
Baxter	19,147	BAX	USA	2.0	7.2	17.9	2.3	5.4	1
Nihon Kohden	2,252	6849	Japan	1.3	19.3	7.7	1.8	3.3	2
Zimmer Biomet	23,314	ZBH	USA	3.9	22.8	13.8	1.9	3.8	3
Quest Diagnostics	17,298	DGX	USA	2.3	20.3	9.2	2.7	5.0	4
Johnson & Johnson	402,876	JNJ	USA	4.8	11.5	41.3	5.9	4.5	5
Getinge	5,357	GETI B	Sweden	1.9	22.8	7.6	1.8	2.9	6
Medtronic	116,745	MDT	Ireland	4.1	31.8	11.4	2.3	4.5	7
Roche	267,534	ROG	Switzerland	4.3	19.8	19.6	7.8	5.0	8
GE HealthCare	39,981	GEHC	USA	2.4	25.5	8.0	5.6	4.3	9
Philips	28,135	PHIA	Netherlands	1.7	-54.6	-2.6	2.1	6.4	10
Teleflex	11,542	TFX	USA	4.4	32.4	12.0	2.6	3.6	11
Qiagen	9,888	QIA	Netherlands	5.3	29.0	17.4	2.6	3.0	12
Garmin	34,777	GRMN	Switzerland	6.3	27.0	24.7	5.0	3.4	13
Alphabet	1,933,495	GOOGL	USA	6.0	26.2	24.0	6.8	3.6	14
Agilent Tech	39,697	A	USA	6.0	32.0	18.1	6.8	3.7	15
Becton Dickinson	68,312	BDX	USA	4.3	46.0	7.7	2.6	3.1	16
Omron	8,197	6645	Japan	1.6	147.8	1.0	1.5		17
Siemens Healthineers	64,003	SHL	Germany	3.4	38.3	7.0	3.2	2.2	18
Terumo	27,262	4543	Japan	4.4	37.5	11.5	3.0	1.7	19
Abbott	199,044	ABT	USA	5.2	34.8	14.3	5.2	2.5	20
Danaher	191,018	DHR	USA	8.5	40.1	19.9	3.6	3.0	21
Smith & Nephew	13,333	SN.	UK	2.9	50.7	4.7	2.6	1.4	22
Edwards Lifesciences	41,523	EW	USA	6.8	29.6	23.4	6.2	1.5	23
Thermo Fisher Scientific	233,743	TMO	USA	6.1	39.0	14.0	5.0	3.0	24
3M	72,597	MMM	USA	2.5	-10.4	-21.4	15.1	7.0	25
MicroPort	1,082	853	China	2.3	-2.3	-50.2	1.4	-36.8	26
Apple	3,357,834	AAPL	USA	8.9	34.6	25.3	54.0	3.0	27
Stryker	137,256	SYK	USA	7.2	43.4	15.4	7.4	2.3	28
Coloplast	28,710	COLO B	Denmark	8.7	40.5	19.5	11.2	1.5	29
Illumina	20,484	ILMN	USA	4.6	-17.6	-25.8	3.6	1.4	30
DexCom	27,979	DXCM	USA	7.7	51.7	14.9	13.5	1.8	31
Intuitive Surgical	170,872	ISRG	USA	23.2	95.0	25.2	12.8	0.4	32
Boston Scientific	120,696	BSX	USA	9.1	75.8	11.2	6.3	1.5	33
Biotronik	Unlisted	Unlisted	Germany						34
Median				4.4	30.7	12.9	3.6	3.0	
Mean				5.1	30.8	10.2	6.4	1.8	

Key: Green denotes that the company is cheap (15% more attractively priced than the median value for the sector) relative to its global peers; amber denotes it is within 15% of the sector median value; and red denotes that it is expensive relative to its global peers. Private companies are shown at the bottom of these rankings by default because they do not have a publicly listed market price. See the methodology section at the back of this report for an explanation of our research methodology.

Source: GlobalData

Risk screen

Our risk screen ranks companies within a particular sector based on overall investment risk.

Medical Devices (34 companies)			Weighting	Risk Screen 40%	30%	15%	15%	100%
Company	MKT CAP (US$ M)	Ticker	Country	Operational Risk	Financial Risk	Industry Risk	Country Risk	Risk Ranking
Edwards Lifesciences	41,523	EW	USA	4	4	4	5	1
Alphabet	1,933,495	GOOGL	USA	4	4	4	3	2
Roche	267,534	ROG	Switzerland	4	3	4	5	3
Intuitive Surgical	170,872	ISRG	USA	4	4	4	3	4
Johnson & Johnson	402,876	JNJ	USA	4	3	4	4	5
Quest Diagnostics	17,298	DGX	USA	4	3	3	5	6
Apple	3,357,834	AAPL	USA	5	3	3	3	7
Thermo Fisher Scientific	233,743	TMO	USA	4	3	4	4	8
Abbott	199,044	ABT	USA	4	3	4	4	9
Siemens Healthineers	64,003	SHL	Germany	4	3	4	3	10
Omron	8,197	6645	Japan	3	4	3	3	11
Coloplast	28,710	COLO B	Denmark	3	3	4	4	12
Medtronic	116,745	MDT	Ireland	4	3	4	4	13
Nihon Kohden	2,252	6849	Japan	2	4	4	4	14
Terumo	27,262	4543	Japan	3	3	4	4	15
3M	72,597	MMM	USA	4	3	3	3	16
Agilent Tech	39,697	A	USA	3	3	4	4	17
Danaher	191,018	DHR	USA	3	3	4	3	18
Qiagen	9,888	QIA	Netherlands	4	3	4	4	19
DexCom	27,979	DXCM	USA	3	3	4	5	20
Biotronik	Unlisted	Unlisted	Germany	3	3	4	5	21
Boston Scientific	120,696	BSX	USA	4	2	4	4	22
Stryker	137,256	SYK	USA	4	2	4	4	23
Baxter	19,147	BAX	USA	3	3	4	3	24
Illumina	20,484	ILMN	USA	3	3	4	3	25
Becton Dickinson	68,312	BDX	USA	3	2	4	4	26
GE HealthCare	39,981	GEHC	USA	3	2	4	5	27
Getinge	5,357	GETI B	Sweden	3	3	4	3	28
Philips	28,135	PHIA	Netherlands	3	3	4	3	29
Smith & Nephew	13,333	SN.	UK	3	2	4	4	30
Teleflex	11,542	TFX	USA	3	2	4	3	31
Garmin	34,777	GRMN	Switzerland	3	3	3	2	32
Zimmer Biomet	23,314	ZBH	USA	3	2	4	3	33
MicroPort	1,082	853	China	2	2	4	4	34

Key: Green denotes low risk; amber denotes medium risk; red denotes high risk. See the methodology section at the back of this report for an explanation of our research methodology.

Source: GlobalData

Glossary

Term	Definition
3D modeling	The process of developing a mathematical coordinate-based representation of the world. This is done by representing each physical object using a collection of points in 3D space, connected by various geometric entities such as triangles, lines, and surfaces.
AI chips	Refers to chips that are designed to perform AI tasks more efficiently, thereby reducing the time taken to, for example, process the large data sets associated with machine learning. They are often referred to as AI accelerators and come in a variety of forms, including graphics processing units (GPUs), field programmable gate arrays (FPGAs), and application-specific integrated circuits (ASICs).
AI model	A program or algorithm that utilizes a set of data that enables it to recognize certain patterns, often using machine learning techniques. It can be used to make predictions, recommendations, or decisions.
Algorithm	A finite sequence of well-defined instructions implemented by a computer to solve a class of problems or to perform a computation.
Application programming interface (API)	A set of defined methods of communication between programs so that information can be exchanged without the need to access the core of either program.
Artificial general intelligence (AGI)	Also known as strong AI or general AI. A theoretical form of AI whereby a machine would require an intelligence equal to humans. As such, it would be sentient and have a self-aware consciousness that can solve problems, learn, and plan for the future. This is the most ambitious definition of AI, the holy grail of AI, but for now remains purely theoretical.
Artificial intelligence (AI)	Refers to software-based systems that use data inputs to make decisions on their own.
Artificial neural network (ANN)	Inspired by the structure of the brain, ANNs are one of the main tools used in machine learning. An artificial neural network has anywhere from dozens to millions of artificial neurons—called units—arranged in a series of layers. The input layer receives various forms of information from the outside world. This is the data that the network aims to process or learn about. From the input unit, the data goes through one or more hidden units with the aim of transforming the input into something the output unit can use. The term is often used to refer to the simplest type of neural network, also known as a feedforward neural network, as it processes inputs only in the forward direction. It can work with incomplete knowledge and is fault-tolerant, but it is less powerful than other types, such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs).
Application-specific integrated circuits (ASICs)	Silicon chips designed to do a single specific task.
Augmented reality (AR)	Technology that allows the user to see the real world overlaid with a layer of digital content. This digital content layer can include sensor-based data, sound, video, graphics, or other datasets.
Automated home	The automation and control of household appliances—such as a fridge, TV, door lock, kettle, or light bulb—via connection to the internet.

Term	Definition
Automated machine learning (AutoML)	The process of automating time-consuming, iterative tasks of machine learning model development.
Autonomous vehicle (AV)	Any vehicle that can drive itself without human intervention. There are five autonomous driving levels, of which the highest (Level 5) describes a vehicle that is fully autonomous under any conditions. This level is unlikely to be reached in the next 20 years.
Big data	Extremely large, diverse data sets that, when analyzed in aggregate, can reveal patterns, trends, and associations, especially relating to human behavior and interactions.
Bus	A communication bus is a data highway typically used to transfer data between components such as the central processing unit (CPU) and the dynamic memory within a computer system.
Business intelligence (BI)	Technologies, applications, and practices for the collection, integration, analysis, and presentation of business information.
Central processing unit (CPU)	The unit that performs most of the processing inside a computer. It carries out all the logical and arithmetical operations.
Collaborative robot (co-bot)	A robot that is designed to work alongside humans on specific tasks.
Computer vision (CV)	One of the key AI technologies, this category includes all technology that attempts to capture and interpret images or videos in a meaningful or useful way.
Context-aware computing	Refers to systems that adapt their behavior according to the physical environment in which they are operating. Contextual information can include location, orientation, temperature, light, pressure, and humidity.
Conversational platforms	Tools that employ a variety of technologies—including speech recognition, natural language processing (NLP), contextual awareness and machine learning—to enable human-like interaction with computer systems.
Convolutional neural network (CNN)	One of the most popular neural networks used today. It uses multiple layers of fully interconnected nodes, allowing it to automatically detect important features without any human supervision. These neural networks are suitable for image recognition problems but require lots of training data.
Computer vision as a service (CVaaS)	A type of software as a service (SaaS) hosted in the cloud that allows businesses to rent rather than build a computer vision platform.
Data center	A facility used to house computer systems and associated networking equipment to capture, store, analyze, and re-transmit data.
Deep learning	A field of ML that is built using artificial neural networks that model the way neurons in the human brain talk to each other.
Edge computing	Refers to a network architecture concept that enables cloud computing capabilities and an IT service environment at the edge of the network. By running applications and performing processing tasks closer to the customer, edge computing delivers superior performance with reduced latency.

Term	Definition
Emotion AI	Technology that aims to read a person's emotional responses by analyzing videos and photos and using predictive analytics to map these reactions.
Explainable artificial intelligence (XAI)	A set of tools and frameworks that help to develop interpretable and inclusive AI models.
Facial recognition	A software application capable of identifying or verifying a person by comparing and analyzing patterns based on the person's facial contours.
Field programmable gate array (FPGA)	Chips that can be configured by the user. They contain a large pool of logic gates that can be ordered and combined in an almost infinite number of designs. FPGAs can be programmed to run a specific algorithm for a particular task and then reprogrammed for another purpose once the task is complete.
Foundational AI models	A type of AI model designed to produce a wide and general variety of outputs rather than being very good at a very specific knowledge domain and type of content, such as text, audio, or video. It is also often called general purpose AI (GPAI).
Foundry	A factory that manufactures semiconductors and integrated circuits.
General Data Protection Regulation (GDPR)	A regulation that came into force across the EU in May 2018, giving consumers certain rights and protections over the data that organizations hold on them, including the right to data portability.
Geofence	A virtual geographic boundary, defined by global positioning system (GPS) or radio-frequency identification (RFID) technology, that enables software to trigger a response when a mobile device enters or leaves a particular area.
Geometric modeling kernel	Geometric (or 3D) modeling kernels are software components that provide the functionality to develop a mathematical coordinate-based representation of the world. This is needed by CAD software systems used to design cars and airplanes, but it is also required of autonomous vehicles and robots that need to be aware of their surroundings. These 3D modeling kernels achieve this by representing each physical object using a collection of points in 3D space, connected by geometric entities such as triangles, lines, and curved surfaces.
Graphics processing unit (GPU)	A programmable logic chip specialized for display functions. Modern GPUs can manipulate computer graphics and provide image processing very efficiently. They are also able to take large data sets and perform the same operation repeatedly and at high speed, which has made them fundamental to the development of artificial intelligence technologies.
Hallucination	In the AI field, this refers to a response generated by AI that contains false or misleading information but is presented as fact. For instance, large language models are known to produce hallucinations when they are not able to find the right answer to a query.
Image recognition	An image recognition-enabled computer can look at an image and discern objects and features. A digital image is a binary representation of visual data that contains a grid of pixels with values that denote how bright and what color each pixel should be. Image recognition algorithms discern objects and features in an image by recognizing similar patterns in the grid of pixels by comparing them to a database of known images.

Term	Definition
Integrated circuit (IC)	An electronic circuit formed on a piece of semiconducting material that can be programmed to perform certain tasks such as computing or storing data.
Knowledge representation and reasoning (KRR)	A field of AI dedicated to representing information about the world in a form that a computer system can use to solve complex tasks using logic and reasoning. Such systems can be used to diagnose a medical condition, have a conversation using natural language, or decide the next move of a robotic arm.
Large language model (LLM)	A type of AI model that can perform various natural language processing tasks, including generating and classifying text, answering questions, and translating languages. A language model is considered large if it has over 100 billion internal parameters or internal nodes, which it updates as it learns. Examples of LLMs are OpenAI's GPT-4 and Google's Gemini.
Large language model (LLM) parameters or weights	The initial value of the nodes of the neural networks used to implement the LLM. Training an LLM consists of gradually adjusting these internal values as it is exposed to training data containing both the input and the expected output.
Latency	The time it takes a data packet to transit from point A to point B.
Light detection and ranging (LiDAR)	A remote sensing method that uses light in the form of a pulsed laser to measure ranges (variable distances) to the Earth. These light pulses—combined with other data recorded by the airborne system—generate precise, three-dimensional information about the shape of the Earth and its surface characteristics.
Machine learning	An application of AI that gives computer systems the ability to learn and improve from data without being explicitly programmed.
Machine vision (MV)	This technology applies computer vision to industrial and manufacturing functions. It is a combination of software and hardware that provides operational control to devices to execute functions such as capturing and processing images and measuring various characteristics required for decision-making.
Neural networks (NNs)	Inspired by the structure of the brain, NNs are one of the main tools used in machine learning. An artificial NN has anywhere from dozens to millions of artificial neurons—called units—arranged in a series of layers. The input layer receives various forms of information from the outside world. This is the data that the network aims to process or learn about. From the input unit, the data goes through one or more hidden units with the aim of transforming the input into something the output unit can use.
Neuromorphic computing	Event-driven computing that apes the human cortex by tightly integrating memory and processing via neurons laid with synapses, rather than separating them with a bus in a clocked, sequential system. The neuro-synaptic approach promises to increase system performance by an order of magnitude while running on only a few watts.
Object detection	This identifies real-world objects (such as humans, buildings, or cars) in digital images and videos. It is powered by algorithms that follow the same process of image classification described above.
Predictive maintenance	The asset management practice of repairing an asset or piece of equipment before it fails based on data received about it. The use of sensors to generate “predictive maintenance” is one of the tenets at the heart of the Industrial Internet.

Term	Definition
Retrieval augmented generation (RAG)	A design approach that aims to make large language models more reliable by automatically retrieving document chunks from external knowledge bases that are relevant to the original question, typically using semantic search.
Retriever model	AI models that rank documents based on the probability that the document is relevant to the query.
Semantic search	The ability of search engines to consider the intent and contextual meaning of search phrases when serving content to users on the web.
Sensor	A device that detects or measures a physical property and then responds accordingly.
Silicon photonics	An emerging technology in which data is transferred between silicon chips by optical rays (i.e., laser light), which can carry far more data in less time than traditional electrical conductors.
Smart city	A city that uses connected sensors to enhance the quality and performance of urban services such as energy, transport, and utilities to make the city function more efficiently.
Smart speaker	A wireless speaker with an in-built voice-activated virtual assistant.
System on a chip (SoC)	A microchip that contains all the components required for a given electronic system, such as a computer, on a single integrated circuit. Its components usually include a GPU, a CPU, and system memory.
Video recognition	As a content analysis tool, video recognition technology dives deep into a video stream to identify useful information about the content. In most cases, video recognition software analyzes audio and video clips, compares them to a database of content, and determines if there is a match.
Virtual reality (VR)	Technology that aims to immerse the user in an entirely artificial world, which has the illusion of reality. It uses special equipment such as headsets or gloves fitted with sensors to simulate a user's physical presence in a 3D environment.
Source: GlobalData	

Further Reading

GlobalData reports

Publication date	Report title
August 2024	Thematic Intelligence: The Future of Healthcare
June 2024	Thematic Intelligence: Artificial Intelligence
May 2024	Thematic Intelligence: GlobalData's AI Governance Framework
May 2024	Thematic Intelligence: Next-Generation Chips
May 2024	Thematic Intelligence: High-Performance Computing
April 2024	Thematic Intelligence: Augmented Reality in Healthcare
April 2024	Thematic Intelligence: Executive AI Briefing – 3rd Edition
February 2024	Thematic Intelligence: Cloud Computing
February 2024	Thematic Intelligence: Patient Empowerment
December 2023	Thematic Intelligence: Internet of Things in Healthcare 2023
October 2023	Thematic Intelligence: AI Executive Briefing – 2nd Edition
October 2023	Thematic Intelligence: Digital Therapeutics
September 2023	Thematic Intelligence: Wearable Tech (2023)
August 2023	Thematic Intelligence: Data Analytics
June 2023	Thematic Intelligence: Precision & Personalized Medicine
May 2023	Thematic Intelligence: The Metaverse in Healthcare
May 2023	Thematic Intelligence: Immuno-oncology
April 2023	Thematic Intelligence: Femtech
November 2022	Thematic Intelligence: Robotics in Healthcare

Source: GlobalData

Our Thematic Research Methodology

Companies that invest in the right themes become success stories. Those that miss the important themes in their industry end up as failures.

Viewing the world's data by themes makes it easier to make important decisions

We define a theme as any issue that keeps a senior executive awake at night. GlobalData's thematic ecosystem is a single, integrated global research platform that provides an easy-to-use framework for tracking all themes across all companies in all sectors. It has a proven track record of identifying critical themes early, enabling companies to make the right investments ahead of the competition and secure that all-important competitive advantage.

Traditional research does a poor job of picking winners and losers

The difficulty in picking tomorrow's winners and losers in any industry arises from the sheer number of technology cycles—and other themes—that are in full swing right now. Companies are impacted by multiple themes that frequently conflict with one another. What is needed is an effective methodology that reflects, understands, and reconciles these conflicts.

That is why we developed our thematic engine

At GlobalData, we have developed a unique thematic methodology for ranking all major companies in all major sectors based on their relative strength in the big themes that are impacting their industries.

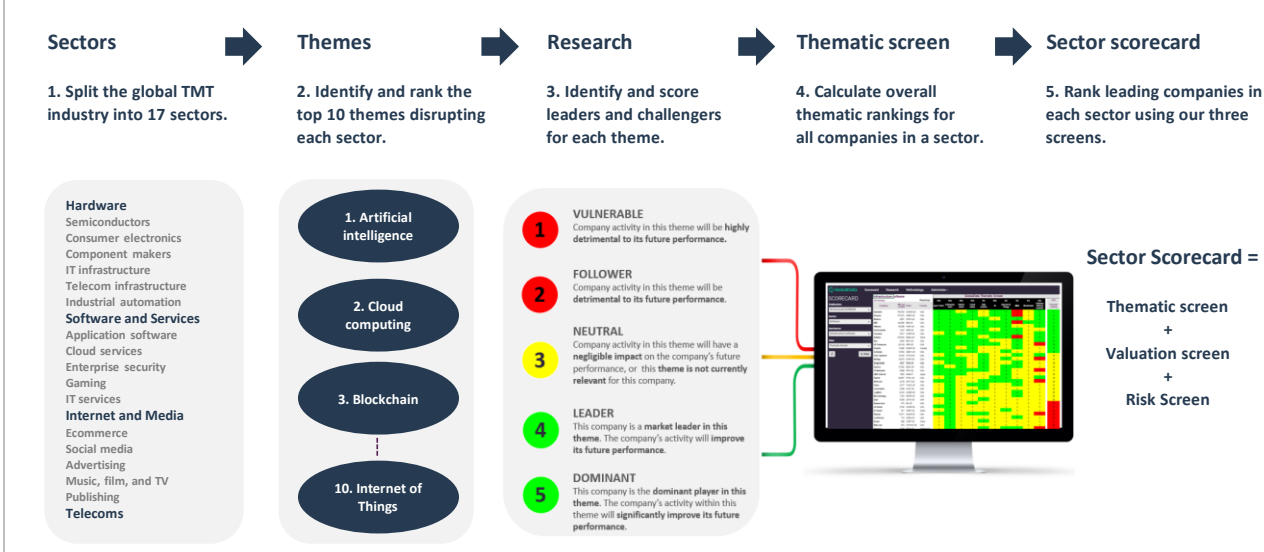
Our thematic engine tags over 180 million data items across six alternative data sets—patents, jobs, deals, filings, social media, and news—to themes. The vast datasets within our thematic engine help our analysts to produce sector scorecards that identify the companies best placed to succeed in a future filled with multiple disruptive threats.

How do we create our sector scorecards?

First, we split each industry into sectors because a different set of themes drives each sector. Taking the TMT (technology, media, and telecom) industry as an example, we split this industry into the sectors shown in the graphic below.

Our five-step approach for generating a sector scorecard

Here we use tech, media, and telecom as an example sector for illustration purposes



Source: GlobalData

Second, we identify and rank the top 10 themes for each sector (these can be technology themes, macroeconomic themes, or industry-specific themes). Third, we publish in-depth research on specific themes, identifying the winners and losers within each theme. The problem is that companies are exposed to multiple investment themes, and specific themes' relative importance can fluctuate. So, our fourth step is to create a thematic screen for each sector to calculate overall thematic leadership rankings after taking account of all themes impacting that sector. Finally, to give a crystal-clear picture, we combine this thematic screen with our valuation and risk screens to generate a sector scorecard used to help assess overall winners and losers.

What is in our sector scorecards?

Our sector scorecards help us determine which companies are best positioned for a future filled with disruptive threats. Each sector scorecard has three screens:

- **The thematic screen** tells us who are the overall leaders in the 10 themes that matter most, based on our thematic engine.
- **The valuation screen** tells us whether publicly listed players appear cheap or expensive relative to their peers based on consensus forecasts from investment analysts.
- **The risk screen** tells us who the riskiest players in each industry are, based on our assessment of four risk categories: operational risk, financial risk, industry risk, and country risk.

How do we score companies in our thematic screen?

Our thematic screen ranks companies within a sector based on overall leadership in the 10 themes that matter most to their industry, generating a leading indicator of future earnings growth.

Thematic scores predict the future, not the past. Our thematic scores are based on our analysts' assessment of their competitive position in relation to a theme, on a scale of 1 to 5:

1	**Vulnerable**	The company's activity in this theme will be highly detrimental to its future performance.
2	**Follower**	The company's activity in this theme will be detrimental to its future performance.
3	**Neutral**	The company's activity in this theme will have a negligible impact on the company's future performance, or this theme is not currently relevant for this company.
4	**Leader**	The company is a market leader in this theme. The company's activity in this theme will improve its future performance.
5	**Dominant**	The company is a dominant player in this theme. The company's activity in this theme will significantly improve its future performance.

How do our research reports fit into our overall thematic research ecosystem?

Our thematic research ecosystem is designed to assess the impact of all major themes on the leading companies in a sector. To do this, we produce three tiers of thematic reports:

- **Single theme**: These reports offer in-depth research into a specific theme (e.g., artificial intelligence). They identify winners and losers based on thematic leadership, market position, and other factors.
- **Multi-theme**: These reports cover all themes impacting a sector and the implications for the key players in that sector.
- **Sector scorecard**: These reports identify those companies most likely to succeed in a world filled with disruptive threats. They incorporate our thematic screen to show how conflicting themes interact with one another, as well as our valuation and risk screens.

About GlobalData

GlobalData is a leading provider of data, analytics, and insights on the world's largest industries. In an increasingly fast-moving, complex, and uncertain world, it has never been harder for organizations and decision makers to predict and navigate the future. This is why GlobalData's mission is to help our clients to decode the future and profit from faster, more informed decisions. As a leading information services company, thousands of clients rely on GlobalData for trusted, timely, and actionable intelligence. Our solutions are designed to provide a daily edge to professionals within corporations, financial institutions, professional services, and government agencies.

Unique Data

We continuously update and enrich 50+ terabytes of unique data to provide an unbiased, authoritative view of the sectors, markets, and companies offering growth opportunities across the world's largest industries.

Expert Analysis

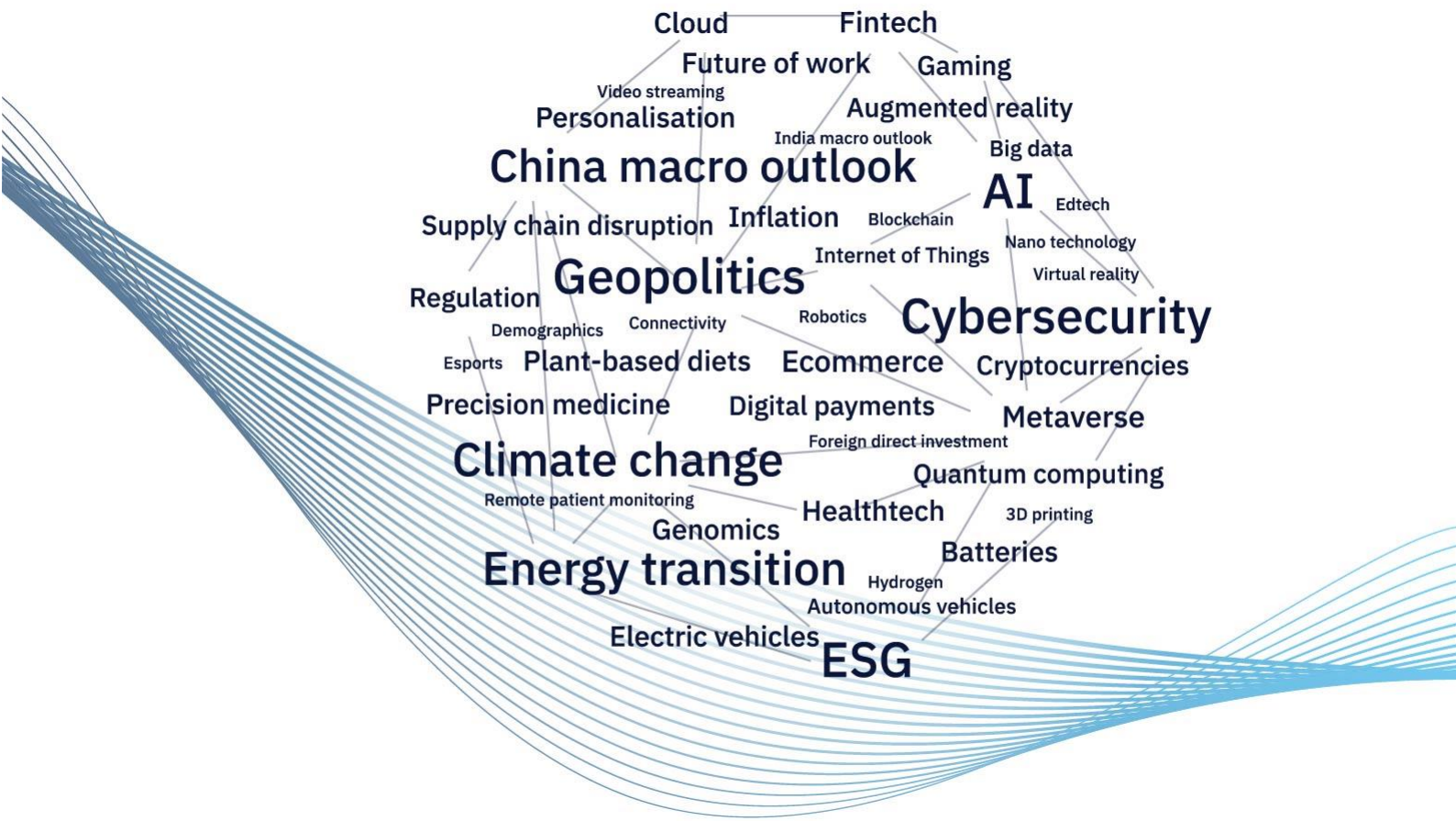
We leverage the collective expertise of over 2,000 in-house industry analysts, data scientists, and journalists, as well as a global community of industry professionals, to provide decision-makers with timely, actionable insight.

Innovative Solutions

We help you work smarter and faster by giving you access to powerful analytics and customizable workflow tools tailored to your role, alongside direct access to our expert community of analysts.

One Platform

We have a single taxonomy across all of our data assets and integrate our capabilities into a single platform – giving you easy access to a complete, dynamic, and comparable view of the world's largest industries.



Contact Us

If you have any more questions regarding our research, please contact us:

Head of Thematic Intelligence
Cyrus Mewawalla
cyrus.mewawalla@globaldata.com
+44 (0) 207 936 6522

Customer Success Team
Understand how to use Thematic Intelligence
customersuccess.thematic@globaldata.com
+44 (0) 207 406 6764