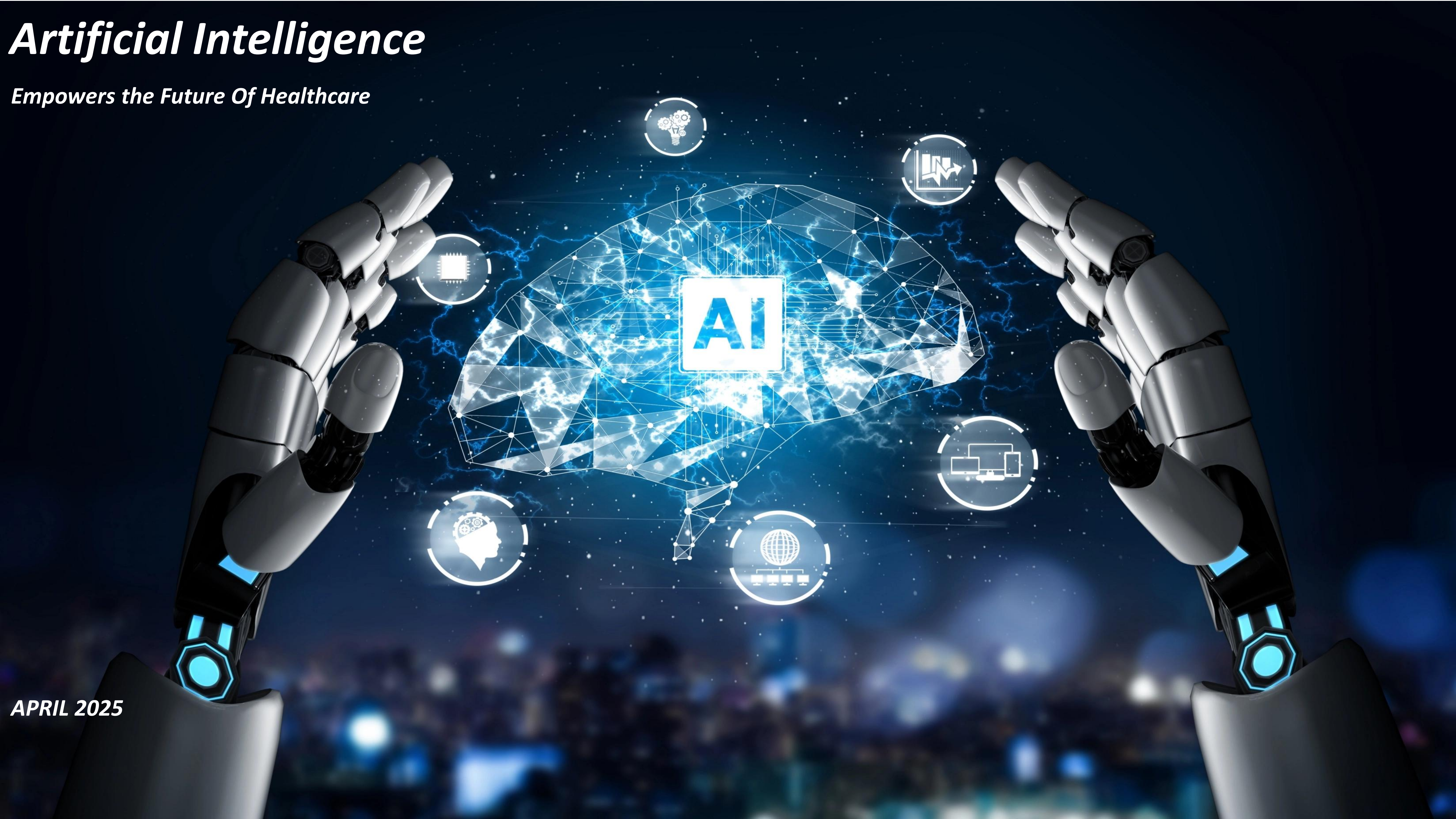
Artificial Intelligence

Empowers the Future Of Healthcare



APRIL 2025

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Introduction (1/2)

Type, Purpose and Scope of Coverage of the Report

Purpose

- This report aims to provide comprehensive insights into the global Healthcare AI and Healthcare GenAI market, assessing its current status, growth potential, and future trends. The AI in healthcare refers to the application of artificial intelligence technologies to improve various aspects of medical practice, research, and patient care. It involves using advanced algorithms, machine learning, and data analytics to mimic human intelligence for problem-solving, decision-making, and automating tasks in healthcare settings.
- The primary purpose of this study is to furnish stakeholders, including industry leaders, investors, and policymakers, with an in-depth analysis of the Healthcare AI market. It seeks to uncover the driving forces behind the market's expansion, understand the challenges and constraints faced by the sector,and Patients' concerns, and risks associated with the ubiquitous generalization of this game-changing category, patient-compliance and safety issues, accuracy issues with the mounting risk of "hallucinations" by AI models, regulatory framework, growth restrictions imposed by the shortage of data-center infrastructures, supply-chain-management, especially with regards to semi-conductor chips, the elevation of trade tariffs notably against imports of AI Chips , the rise in the needs and price of energy required to fuel the functioning of servers and particularly generative AI . By evaluating market dynamics, patients' behaviour, and competitive strategies, the report intends to aid in strategic decision-making, understand, ascertain and calibrate the advantage of an AI-focused digital strategy pervading the entire organizational value stream, external growth strategies and provide forecasts that help in planning long-term growth strategies in the Healthcare industry.

Covered Aspects in the Healthcare AI

Market Players	Healhcare AI and GenAI Overview	Applications	Measure of Benefits
Market Dynamics	M&A and Licensing Dynamics	Regulatory Environment	Market Outlook

Introduction (2/2)

Methodology of The Report

Methodology

The methodology of this report encompasses a combination of primary and secondary research to ensure comprehensive and accurate results. The approach is outlined as follows:

- **Primary Databases:** We have consolidated and analysed 10 years of data collected through diverse market presentations and active contributions to congresses. This also includes interviews carried out with industry experts over the years, including CEOs, Senior Executives and Practitioners, marketing managers from leading collagen-producing firms and medical as well as academic KOLs from the industry. Insights from these interactions provided a real-time understanding of market dynamics and expert opinions on future trends.

- **Secondary Research:** An extensive complementary review of existing scientific and sectorial literature was conducted. This included analyzing industry reports, scholarly articles, company annual reports and analyst conference presentations, as well as market analysis publications to gather historical data and articles in AI magazines to understand the current trends especially when it comes to the most recent hot developments such as Gen AI in Pharma, Hospitals, Telemedicine, Telesurgery, and others. Secondary research helped in identifying the market segmentation and key players, forming a solid foundation for the report.

- **Quantitative and Qualitative Analysis:** Both quantitative data (market size, growth rates, and revenue forecasts) and qualitative insights (market trends, growth drivers, and challenges) were analysed.

- **Market Forecasting:** Using time-series analysis, regression models between various sources of data and market forecasting techniques, the report predicts future market trends. This section provides stakeholders with expected market developments and potential investment opportunities.

The methodology adopted in this study ensures that the report provides a holistic, comprehensive, balanced and consensual view of the global Healthcare AI market, supported by reliable data and scientifically substantiated expert opinions, facilitating strategic decision-making for stakeholders involved.

Section I

AI Growth in both Market and M&A Activity

01

A Dream Of Humanity For Centuries, AI Is On The Verge Of Unleashing The Next Industrial Revolution

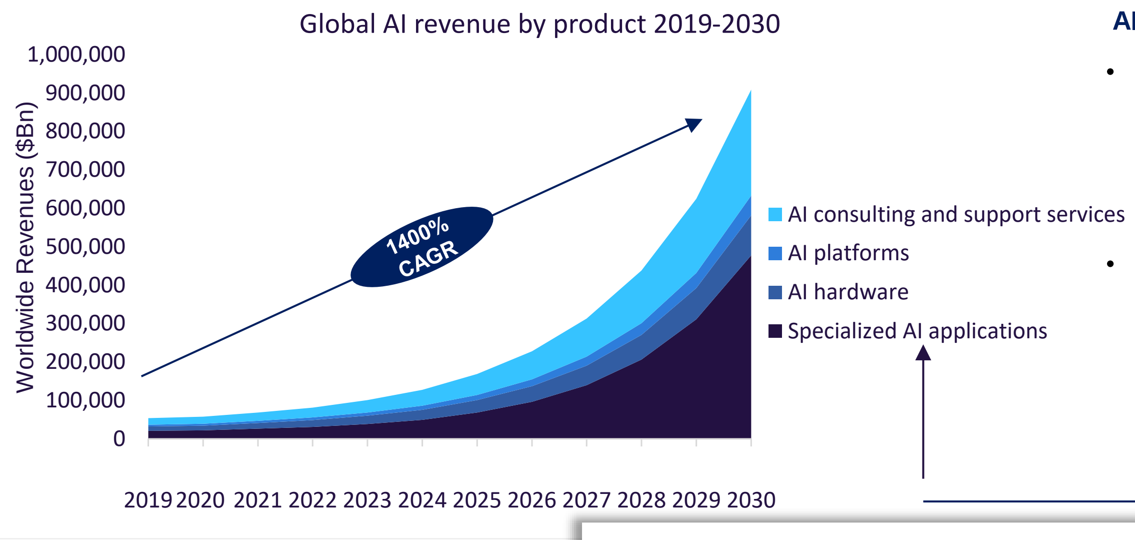
AI's Growth Is Expected To Skyrocket By 15x In 2030

- Recent progress in machine learning (ML) on the back of improved algorithms and increasing computing power has made it possible for AI to solve real-life problems at an unprecedented speed.

- GlobalData estimates the total AI market will be worth **$908.7 Bn in 2030 (1400% CAGR)**

- Within that, the global specialized **AI applications market will be worth $477.6B in 2030**, up from $31.1Bn in 2022**. (+1400%**

- In the early years, AI investments was dominated by computer vision and conversational open-source platforms . In the future, it should become ubiquitous, eg Apple launches a new M3 MacBook Air (2024) powered via AI which will run directly on the hardware thanks to the M3 Chip instead of in the cloud unleashing an unprecedented visual acuity and sound quality



AI Platform Vs Conversational Platform

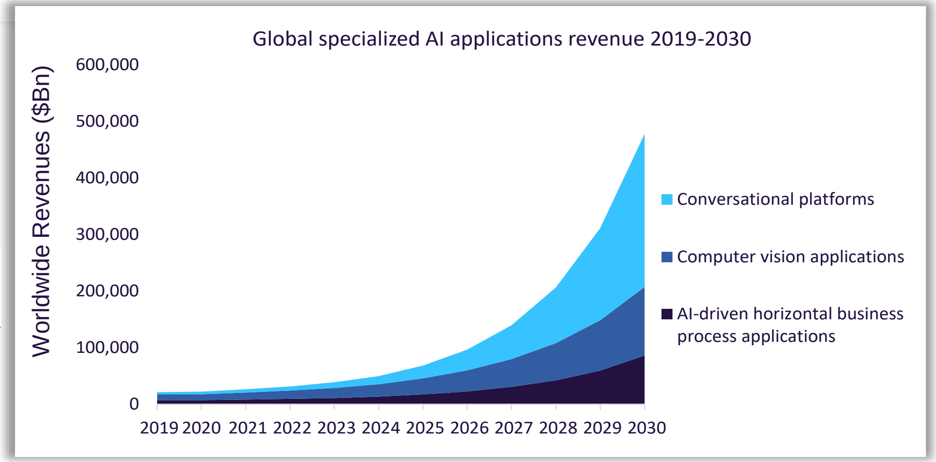
- An artificial intelligence (AI) platform is an integrated set of technologies that empower users to develop, test, deploy, and refresh machine learning (ML) and deep learning systems as well as large language models
- Conversational AI is a technology that helps machines to interact and engage with humans in a more natural and empathetic way to overcome the robotic and systematic aspect of AI and blockchain The interactions are like a conversation with back-and-forth communication.

AI Platforms and Software

Microsoft Azure | Infosys NIA | OpenAI

Conversational AI Applications

BARD | alexa | Google Assistant | MISTRAL AI_ | ANTHROPIC



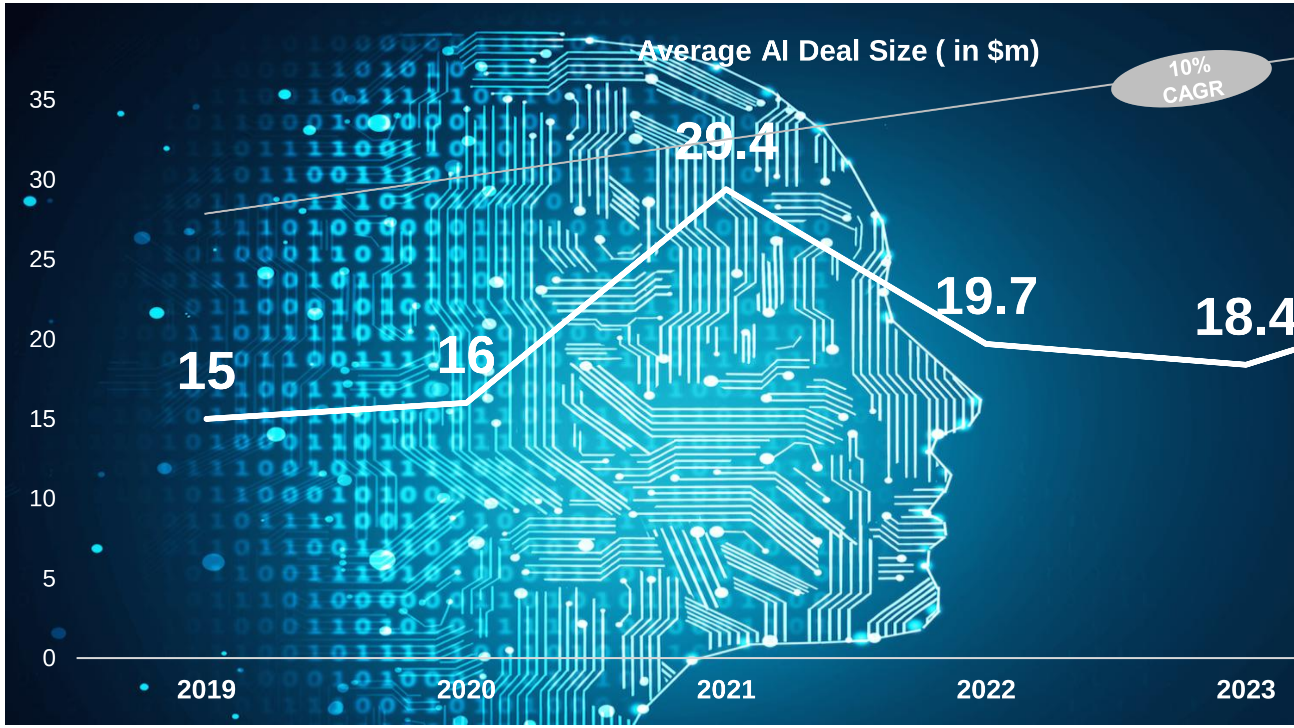
Sources: GLobalData.

AI Breaking Records Of Value-creation Via M&A And Capital Raises In 2024 And Continues This Exponential Trajectory (1/2)

Exponential AI Deals Growth In Terms Of number and Value of deals In Recent Years - 2025 hitting on all cylinders as a Result of Trump's election and consequential initiatives

ARTIFICIAL INTELLIGENCE M&A ACTIVITY

$ 2Bn in 2015 **x12** **$24Bn** in 2024 | **13 AI UNICORNS** in Q3 2024 | **+28% AI M&A DEALS** Vs 2023



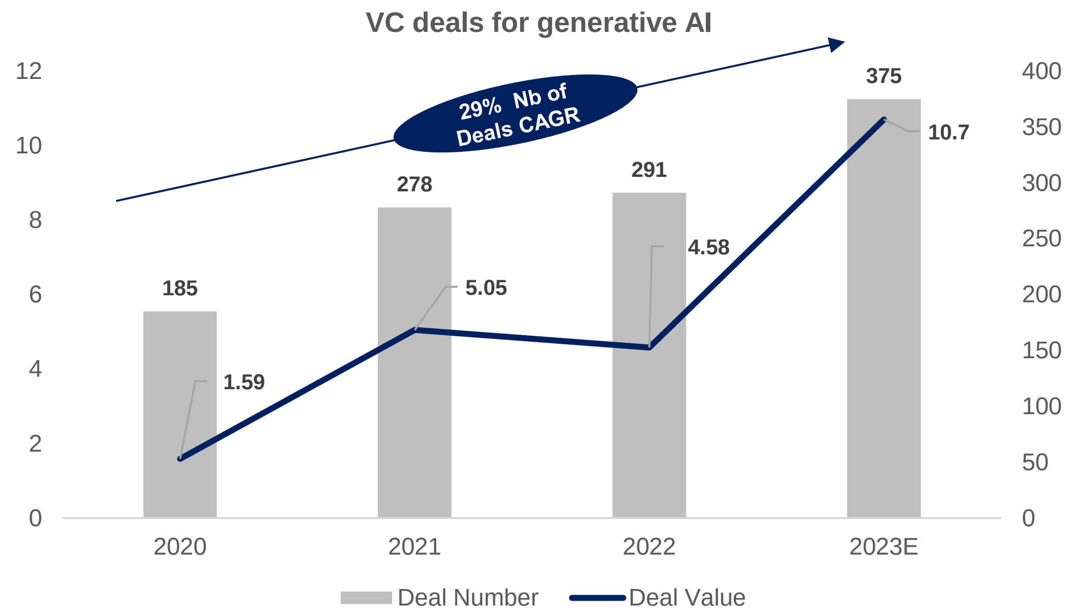
Global AI deal count climbs 24% QoQ to reach 1,245 — its highest quarterly level since peaking in Q1'22

- **In Q3'24**, global AI deal count skyrocketed **24% QoQ to reach 1,245** — its highest quarterly level since peaking in Q1'22.
- **The average AI deal size is $23.5M in 2024 so far — up 28% vs. $18.4M in full-year 2023.** This upward trend has been influenced by a rise in massive **$1B+ deals**, with AI startups drawing **9 of these deals in 2024 so far vs. 4 in full-year 2023. Top $1B+ rounds in 2024 YTD** include:
  - xAI — $6B Series B at a $24B valuation
  - Anthropic — $2.8B Series D at an $18.4B valuation
  - Anduril — $1.5B Series F at a $14B valuation
  - G42 — $1.5B investment from Microsoft
  - CoreWeave — $1.1B Series C at a $19B valuation
  - Skyrocketing trajectory of AI Start-ups financing

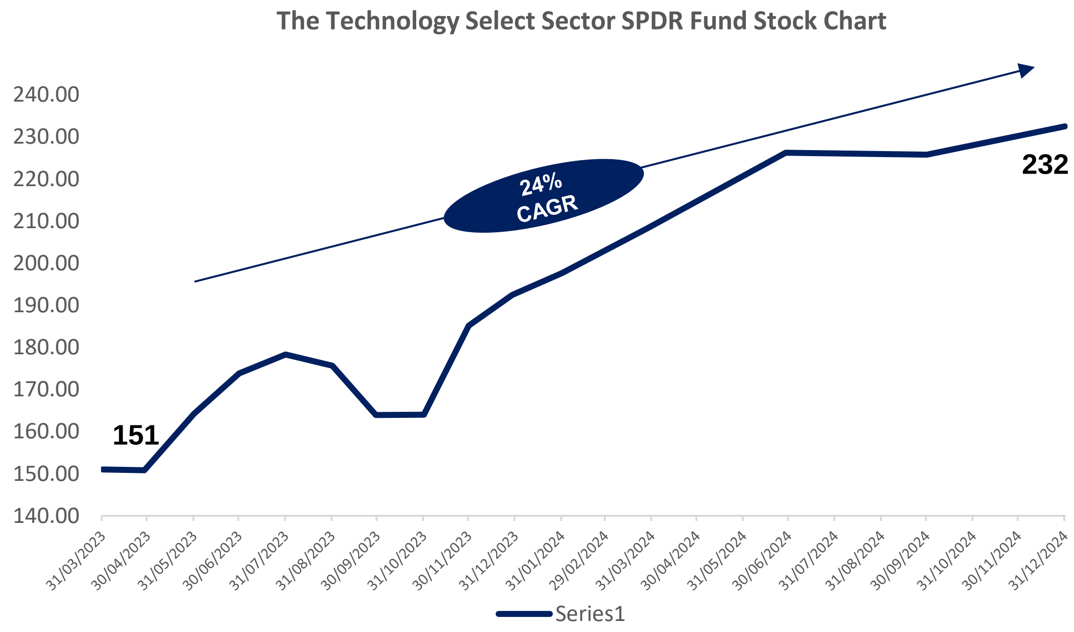
Sources: *CBInsights (State of AI Q2'23 Report, Aug 23).*

Surging Investments And Exponential Growth: AI Breaking All Records Of Value-creation Via M&A And Capital Raises In 2024

Exponential AI Deals Growth In Terms Of number and Value of deals In Recent Years - 2025 hitting on all cylinders as a Result of Trump's election and consequential initiatives



Any update for 2024? no



- Despite mounting pressure on venture capital in a difficult economic environment, money still pours into generative AI startups
- Global VC funding for AI start-ups rose **to $131.5bn in 2024 — up by 52%** from a year earlier, compared to a decline of about **10% to $237bn** for other start-ups, according to preliminary data from PitchBook.

- The ETFs with significant exposure to the ChatGPT stocks made significant gains in 2023: The ETFs **gained 15%-18%** in the last 6 months **and 5%** the previous month.
- **SPDR Select Sector Fund - Technology** (NYSE: XLK), **iShares Global Tech ETF (NYSE: IXN)**, and **Fidelity MSCI Information Technology Index ETF** (NYSE: FTEC) **gained ~22% YTD**.

Sources: CBInsights (State of AI Q2'23 R) , Pitchbook (Generative AI deal count dips in Q3, Oct 23)

Section II

Overview Of GenAI

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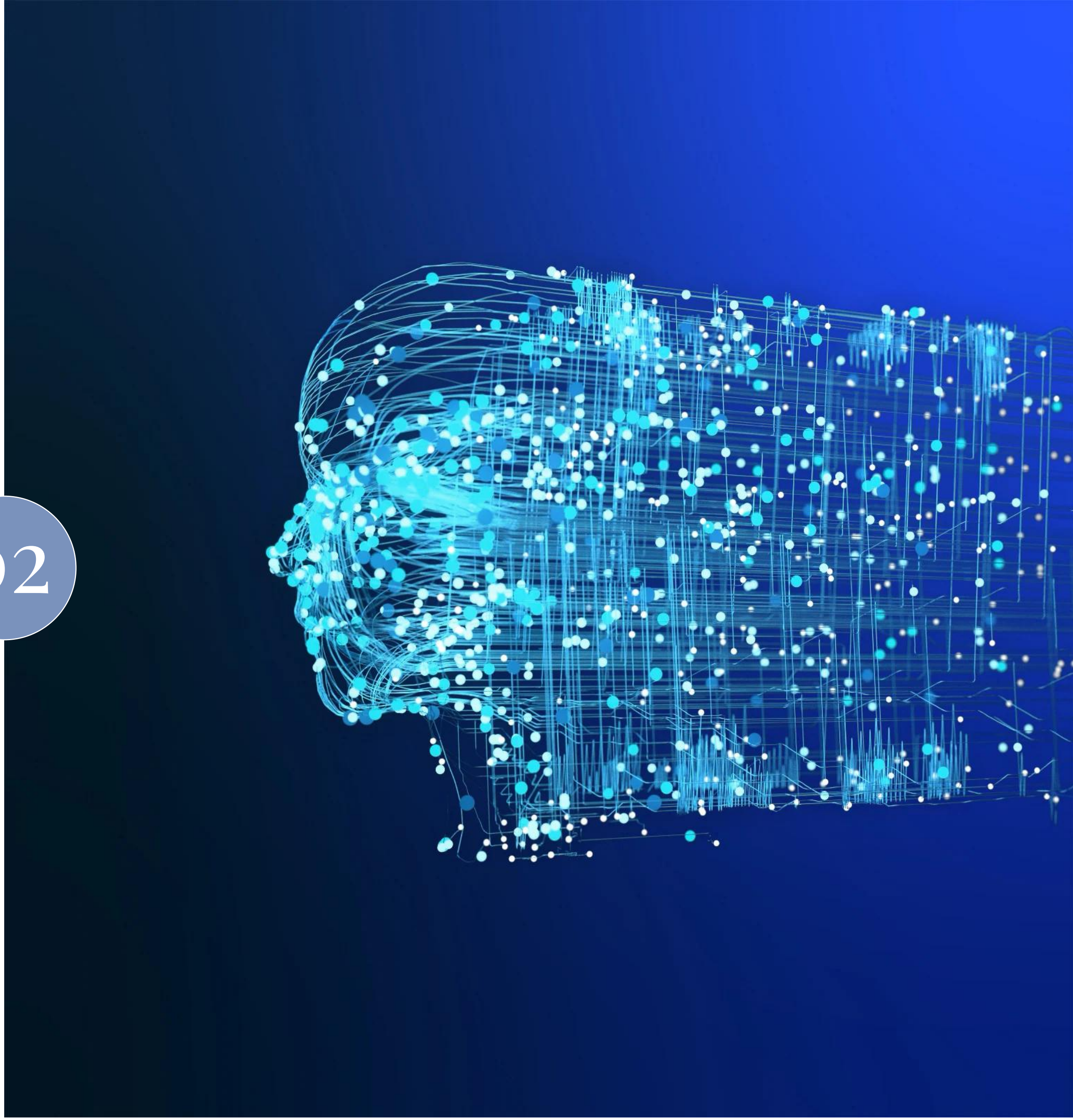


Shaping Tomorrow: Predictive And Generative AI Pioneering And Leading The Path Forward

Distinguishing Dynamics: Predictive vs. Generative AI – Unleashing A Massive Growth Potential

PREDICTIVE AI

Predictive AI is artificial intelligence that collects and analyses data to predict future occurrences. Predictive AI aims to **understand patterns in data and make informed predictions**

DATA COLLECTION, STRATIFICATION AND ORGANIZATION
Ensuring that the data sourced is suitable for the task

PREPROCESSING
It is essential for this data to be filtered

FEATURE AND ALGORITHM SELECTION
•After selecting the right algorithm, it should be trained on specific features to detect is also essential to achieving the desired result

MODEL EVALUATION
The result based on a defined benchmark

PREDICT4HEALTH DataRobot ezra AURORALABS 6sense FLYR C3.ai iz.ai Insider

ARTIFICIAL INTELLIGENCE

PREDICTIVE AI	VS	GENERATIVE AI
✗	CREATION OF NEW CONTENT	✓
✓	DATA ANALYSIS	✗
✓	MACHINE LEARNING USE	✓
✗	RESULTS SIMULATIONS	✓

Predictive AI:
- ✓ Finance
- ✓ Healthcare
- ✓ Research

Generative AI:
- ✓ Music
- ✓ Fashion
- ✓ Art
- ✓ Lifestyle
- ✓ Luxury
- ✓ Video streaming

GENERATIVE AI

Generative AI analyses datasets, figures out the patterns in the given data, and uses the learned patterns **Large Language Models (LLM)** to **produce new data**. These technologies are driving a new era of convenience, productivity, and connectivity. Best example is CHAT GPT from; OpenAI.

GENERATIVE ADVERSARIAL NETWORKS
GANs consist of 2 models (generator model and discriminator model), which compete with each other by discovering and learning patterns in input data.

VARIATIONAL AUTOENCODERS
The encoder takes in the input sample and converts the information into a vector, then the decoder takes the vectors and converts them back to an output

DIFFUSION MODEL
It destroys sample data by adding successive Gaussian noise. Then the models learn to recover the data by removing the noise from the sample data.

Hippocratic AI — Do No Harm — AQEMIA ChatGPT SUBTLE MEDICAL navina

Sources: Geekflare.

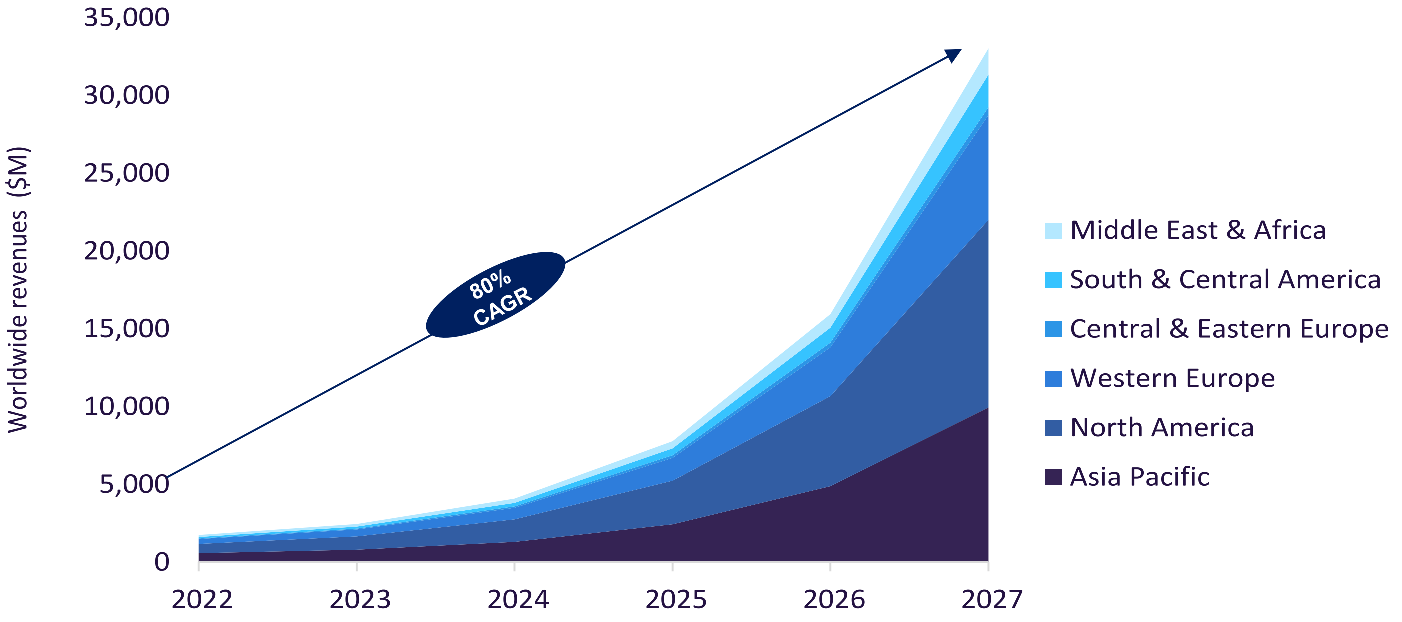
Generative AI: Powering the Innovation Machine with Explosive Growth and Limitless Possibilities

Generative AI Is Expected To Grow Exponentially Affecting Directly The Healthcare Sector by 80% CAGR 22-27 reaching $33Bn

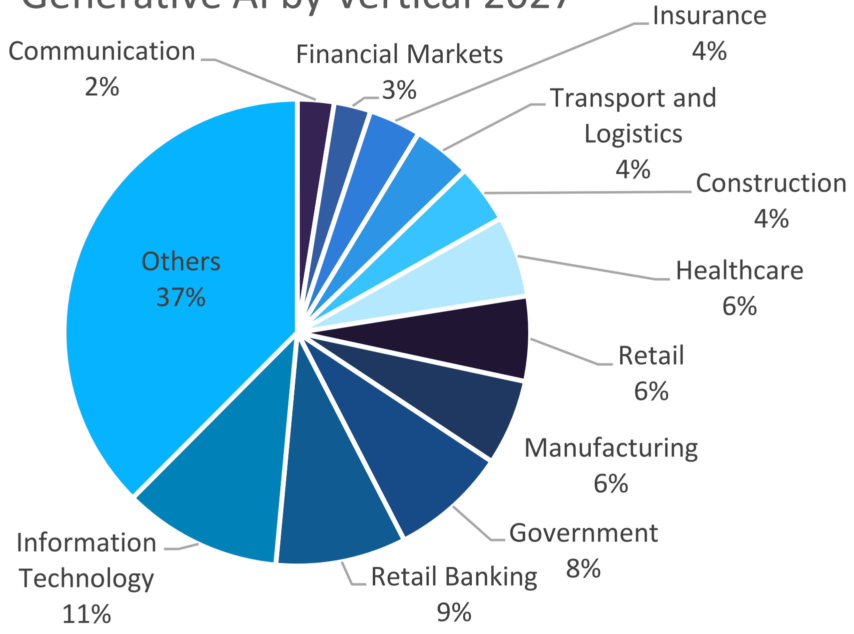
$ 33Bn IN 2027

+80% CAGR 22 27

- GlobalData estimates that the global generative AI market specifically will be worth $33Bn in 2027. Only NVDIA's market cap is 3.1 TN, eg 100X more! I am not even counting other players in generative AI like Microsoft, Alphabet, OpenAI, Entropic, DeepSeek, Bytedance…etc
- It is expected to grow at an **80% CAGR from 2022 to 2027.**
- Most significant early adopting verticals by 2027 will be respectively IT (11%), retail banking (9%), government (8%), **healthcare (6%),** manufacturing (6%), and retail (6%)



Generative AI by Vertical 2027

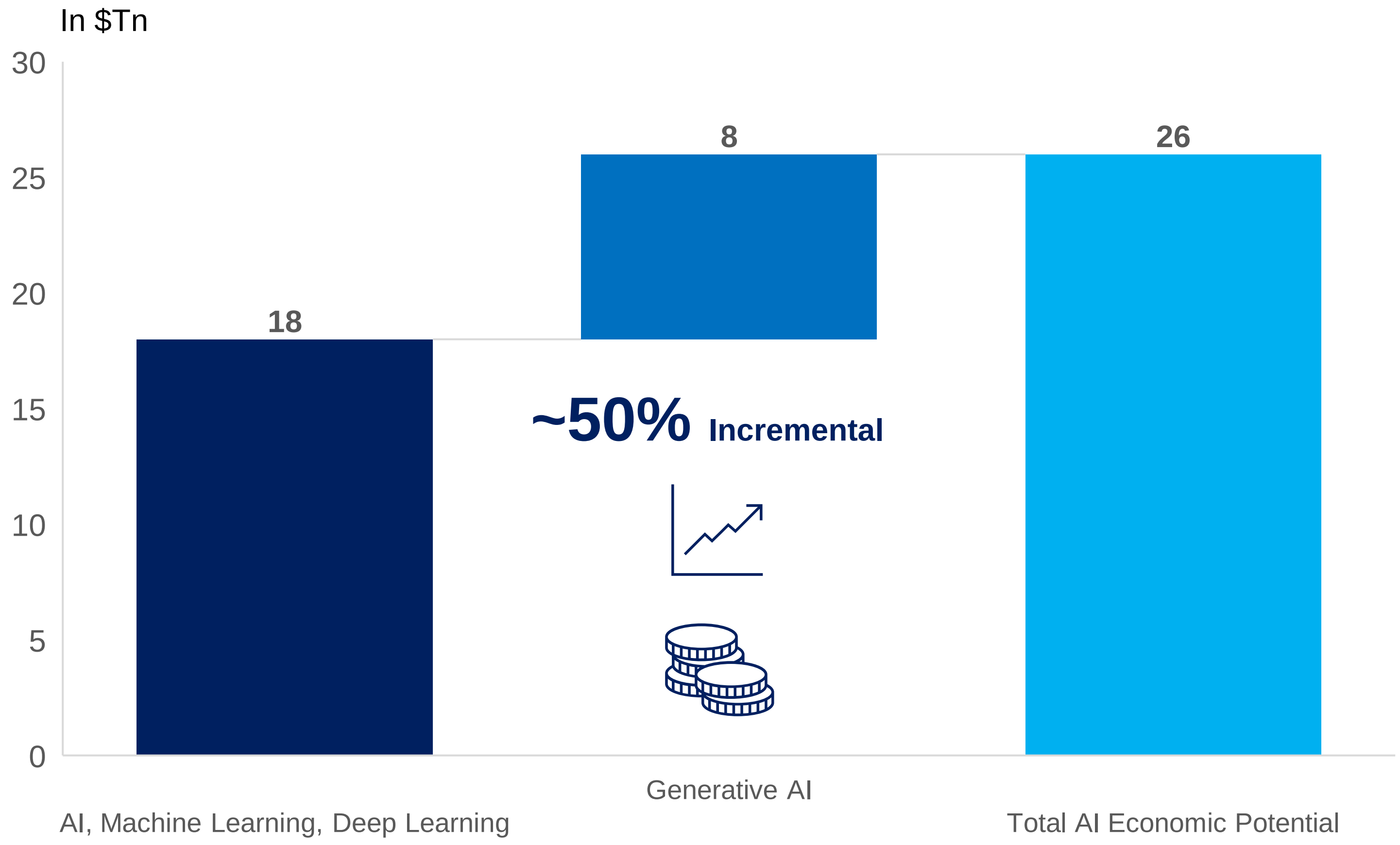


Sources: *GlobalData.*

The Potential Of AI Is Game Changing Reaching Staggering Levels And It Will Consistently Accelerate Its Growth With Gen AI

Generative AI Has 50% Incremental Impact on AI Contribution To the Economy

- **AI, Machine Learning and Deep Learning** combined are expected to Generate Combined Revenues **$11-18 Trillion** in the next few years **Generative AI stand alone** is expected to generate **$6-8 Trillion**



UP TO ~$6-8TRILLION POTENTIAL IMPACT FROM TO BE UNLEASHED BY GEN AI GLOBALLY, WHICH IS COMPARABLE TO THE ECONOMIC IMPACT OF THE INTERNET

Sources: *Mckinsey GenAI in Healthcare Presentation*

Section III

GenAI in Healthcare Industry

03

Section III

AI and GenAI Healthcare Applications Overview

Emerging AI Applications Have Immediate Potential

AI Applications Can Translate Into Transformative Use Cases across The Healthcare Industry

PHARMACEUTICAL COMPANIES

Foundational model for drug discovery and faster and more cost-effective development
Content Creation For regulatory submission

HEALTHCARE PROVIDERS

Next generation triaging and virtual assistants
Diagnosing diseases from telemedicine interviews
Synthesizing patient history, automating docs

CROSS-SECTIONAL

Sales rep co-pilot
Identifying blocking issues and solving them
Drafting contracts, analysing tenders

MEDTECH COMPANIES

Software Development Github co-pilot
Co-Pilot for service technicians/Customers

HEALTHCARE PAYERS

Synthesizing clinical and administrative content
Validating legitimacy of reimbursement claims
Chatbots with self-service customer support

CROSS-SECTIONAL

Personalizing communication material
Self-service Application and recruiting support

ACCELERATED PRODUCT R&D

2-3 Years

Decrease in time to get from first in Human phase 1 to approval

HYPER PERSONALIZATION

>60%

Increase in customer interaction/service volume driven by AI automation and immersiveness of experiential journey

FAST CODING & MODELING

>50%

Productivity Increase for developers utilizing coding co-pilots

VIRTUAL EXPERT, CHATBOT AND ASSISTANT

~15%

Productivity Increase for customer support agents utilizing tools

Sources: Mckinsey

GenAI Can Unlock The Potential Of Unstructured Data In Healthcare

GenAI Can Unlock Value In Healthcare In Multiple Ways

UNLOCK THE POTENTIAL OF UNSTRUCTURED DATA

SUPPORT HEALTHCARE PROFESSIONAL

Reduce Administrative Burden
Support Diagnosis and prescription
Streamline MDT efficiency

IMPROVE PATIENT EXPERIENCE

Tele-Health, tele-diagnostication, Tele-Monitoring and tele-Surgery
Coordination of Health Pathway
Accessibility of health information
Create a captive and immersive ecosystem to augment stickiness

ACCELERATE DRUG DISCOVERY

Drug discovery
High Throughput screening, ADME Testing,
Use of digital twins to significantly reduce R&D costs and time. Predicting the risk of failures
Privacy-preserving collaborations in compliance with GDPR/HIPAA

BOOST ORGANIZATIONAL EFFICENCY

Plan & Coordinate Health Pathway
Continuous Triage
Hospital of The Future

ENABLE POPULATION HEALTH

Health Equity
Population Health& Preventive Care
Consumer Engagement
Empower Public Health and Safety routines

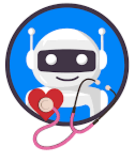
FOSTER TRAINING EDUCATION AND PERFORMANCE MOTIVATION

Medical/Nursing
Pharmacy/Allied Health
Patient/Caregivers

HEALTHCARE SPECIFIC SOLUTIONS

Cloud for Healthcare

Text Analytics for Health



Health Bot

Accessibility of Medical Documentation

De-Identification Services for Health

AI for Medical Imaging

Sources: Microsoft

Section III

AI GenAI Enhancing Efficiency

AI Boosting Healthcare Sales

Artificial Intelligence (AI) is transforming healthcare sales by enhancing efficiency, personalization, and decision-making

Tailored Engagement and Personalized Marketing

- AI analyzes data from healthcare providers and patients to create customized marketing strategies.
- Sales reps are equipped with insights on preferences, expectations, sensitivities and behavior, enabling meaningful conversations with healthcare professionals.
- Predictive analytics anticipates needs, allowing timely and targeted interactions. Personalized outreach has been shown to increase engagement and boost sales by 5-15%.

Predictive Analytics for Smarter Strategies

- AI predicts prescribing patterns and purchasing behaviors, enabling to sales teams proactively adjust strategies.
- By identifying trends and opportunities for cross-selling or upselling, AI enhances the value of customer interactions.
- It also helps predict healthcare provider loyalty, flagging potential switches to competitors and enabling timely re-engagement via re-targeting or promotional measures

Improved Sales Rep Effectiveness

- AI empowers sales representatives with personalized recommendations and discussion points, fostering better client relationships.
- With tools that predict physician needs and preferences, sales reps become more valuable partners in decision-making.
- Automated follow-up suggestions ensure consistent and impactful client engagement.

Automation of Routine Tasks

- AI streamlines administrative tasks like appointment scheduling, data entry, and expense reporting.
- Automating such tasks frees up to 40% of a sales rep's time, allowing more focus on building client relationships and closing deals.

Precision Targeting and Territory Management

- AI enhances targeting by analyzing prescribing behaviors and segmenting healthcare providers for optimal engagement
- For sales territories, AI leverages geographic and demographic data to balance workloads and improve coverage, leading to increased productivity.

Enhanced Customer Retention

- AI identifies at-risk customers by analyzing vulnerabilities and inconsistencies signalling weaknesses in behavior patterns. This allows teams to implement retention strategies and resolve issues proactively, maintaining brand loyalty.

Faster Lead Qualification

- AI tools quickly identify high-potential leads using advanced scoring systems. By focusing on these opportunities, sales cycles are shortened, and conversion rates improve.

Sources: Insight7, Euralis, WBP Analysis

Section III

GenAI Enhancing Healthcare

Gen AI Harbours The Power To Unleash The Full Productivity Potential Of Operations And R&D In Healthcare Sector

Gen AI Impact By Business Functions

Gen AI impact by business functions[1]

Low impact — High impact

	Total, % of industry revenue	Gain vs industry average	Marketing and sales	Patient care[2]	Product and R&D	Software engineering	Operations	Support functions
All industry sectors	1.3 – 2.1 %		27%	12%	9%	25%	12%	15%
Healthcare	1.8 – 3.2%	1,5X	22%	12%		9%	47%	10%
Pharmaceuticals & Med. Products	2.6 – 4.5%	2X	23%	1%	44%	19%	4%	9%

Note: Figures may not sum to 100% because of rounding.
1.Excludes implementation costs (e.g., training, licenses). | 2. Customer care in "Total"

Sources: Mckinsey

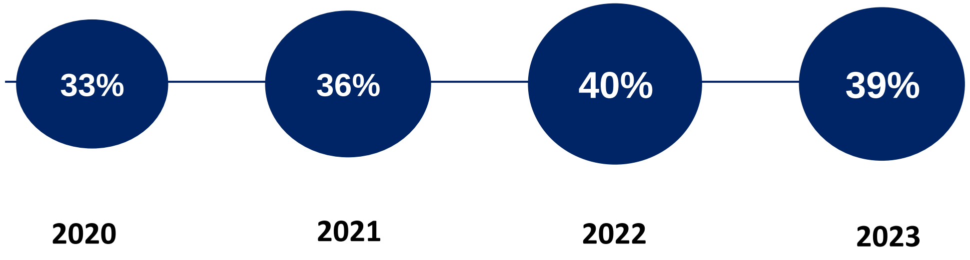
Section III

AI and GenAI in Pharma Industry

AI's Disruptive Impact On The Pharmaceutical Industry Through Data-driven Innovation And Decentralization Of Decision-making (1/3)

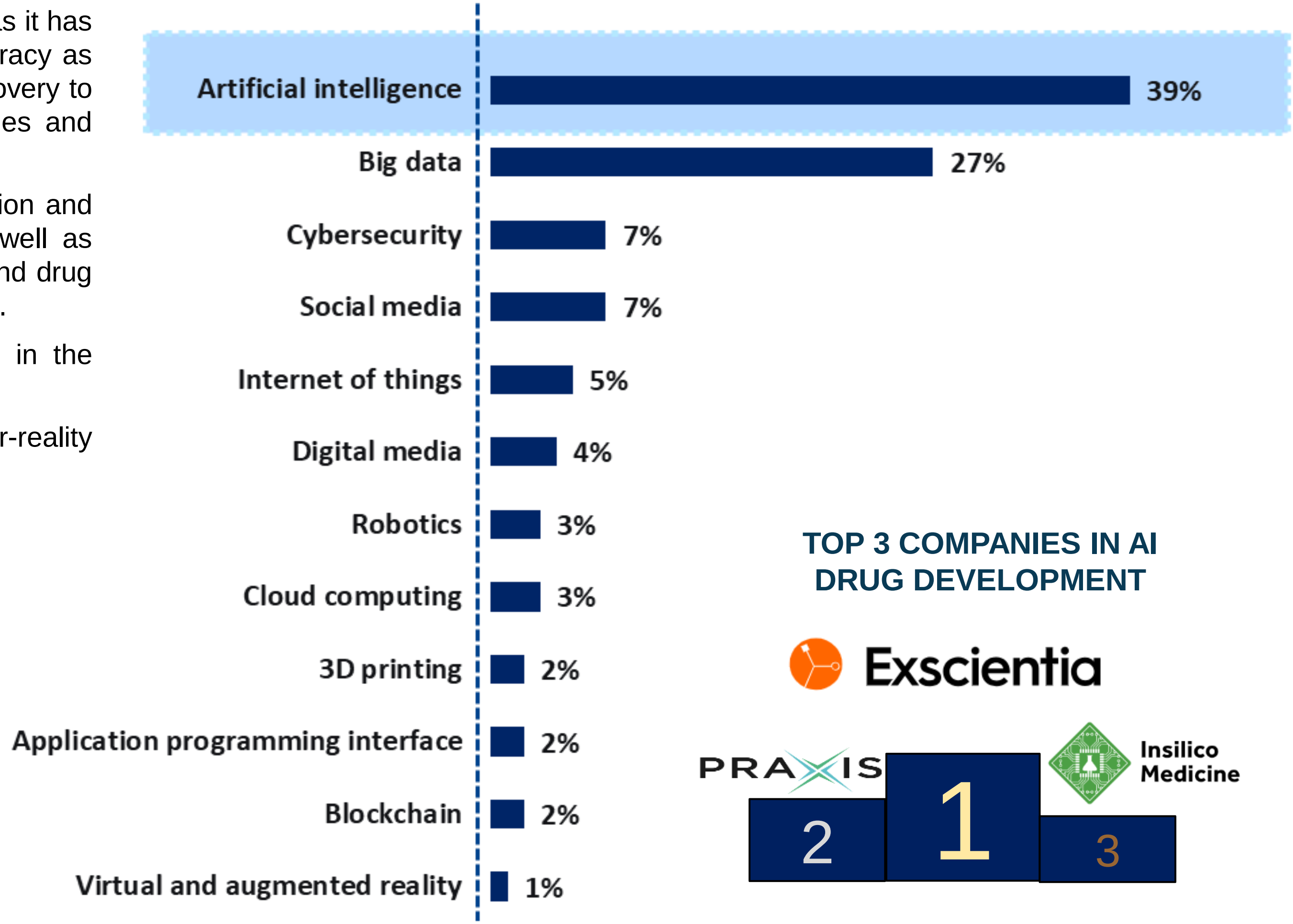
AI Will Continue To Be The Most Disruptive Emerging Technology In Pharma In 2023

- AI plays an increasing dominant role in optimizing the entire value chain, as it has the power to enhance the efficiency, authenticity; sustainability and accuracy as well as speed of execution of a wide variety of processes, from drug discovery to manufacturing, supply-chain, inventory management, order-taking to sales and marketing.
- AI can be leveraged as a staggeringly superior tool for target identification and validation, de novo drug design and lead generation and profiling as well as validation, development and simulation of benefits of combined therapy and drug repurposing, leading to considerably shorter drug development timeframes.
- Pharma companies are just beginning to discover the power inherent in the deployment of Generative AI Programs
- Leveraging AI and Digital capabilities to generate digital twins and near-reality previsualization patient before and after treatment pictures



N = 198

Year-on-Year percentage of Healthcare industry professionals expecting AI to have the greatest impact upon the pharma Industry



TOP 3 COMPANIES IN AI DRUG DEVELOPMENT

Exscientia

PRAXIS

Insilico Medicine

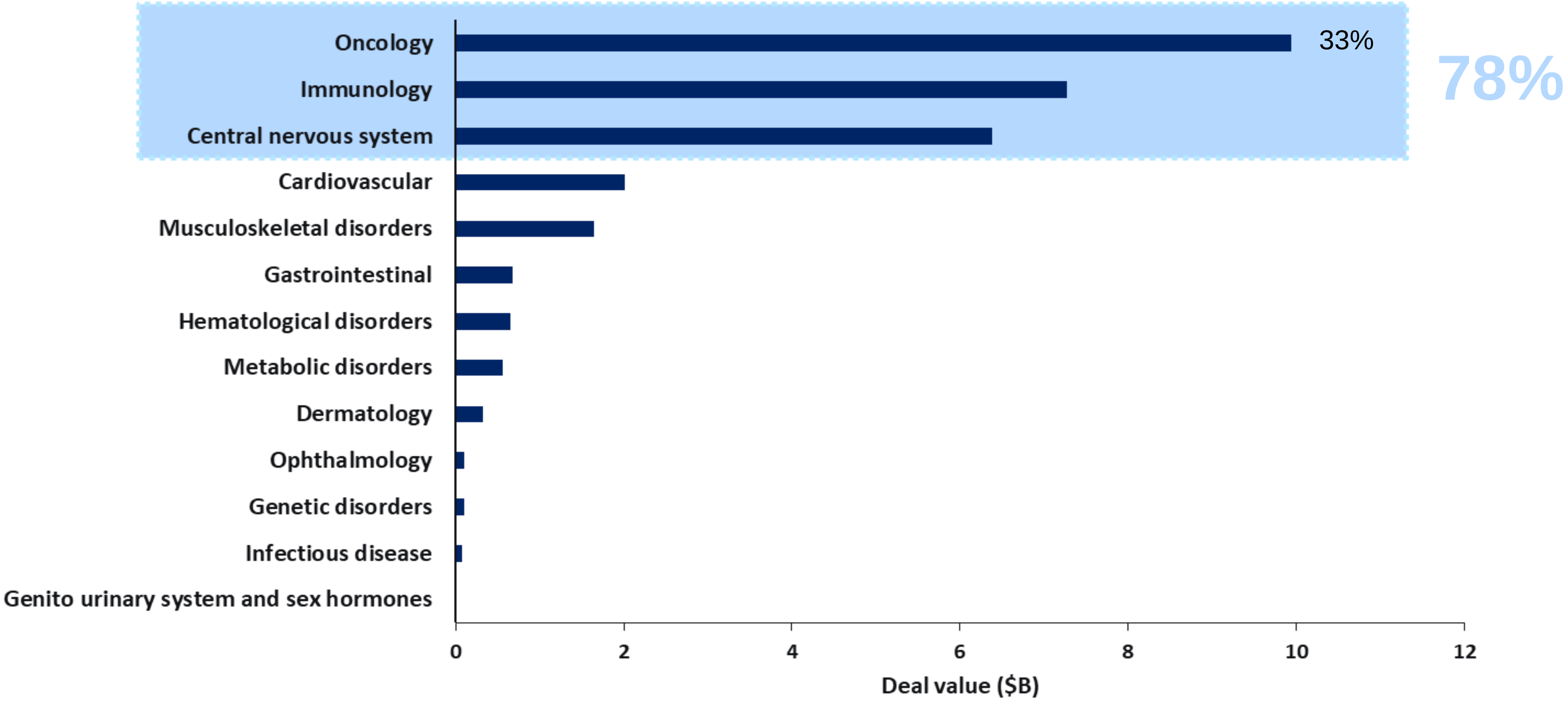
2 1 3

Sources: GlobalData.

AI's Disruptive Impact On The Pharmaceutical Industry Through Data-driven Innovation And Decentralization Of Decision-making (2/3)

AI Will Continue To Be The Most Disruptive Emerging Technology In Pharma In 2023

- Deal value across therapy areas has a fat-tailed distribution **with deal makers prioritizing oncology, immunology, and CNS**, which accounts for **78% of deal value.**
- Oncology accounts for the largest therapy area in terms of number of total deals, with **33% of all deals.**



Sources: GlobalData.

Generative AI Can Be Leveraged By BIG Pharma At Every Step Of The Value Creation Pathway (1/2)

Generative AI accelerates drug discovery, enhances clinical trials, optimizes manufacturing and supply chains, boosts marketing and sales efforts, and improve patient experiences.

Drug discovery & development	Manufacturing	Supply chain & distribution	Regulation	Marketing & sales	Patient experience
De novo drug design/ lead generation	Prediction of quality outcomes	Automated inventory management	Increased efficiency of safety reporting processes	Predicting regulatory marketing approval of competitors	Medication adherence
Target Identification & Validation	Automated design of production systems	Automated route optimization	Summarization of regulatory documents	Market trends prediction	Virtual patient assistance
Drug repurposing	Predictive maintenance models and equipment failure detection	More efficient order tracking	Addressing document inconsistencies before regulatory submission	Personalization to improve engagement and performance	Remote patient monitoring
Enhanced clinical trial design and recruitment				Marketing content preparation	Personalized recommendations
Lead Identification & Validation					Customer support and education

Sources: Global Data, 2024

Section III

GenAI and Anti-Ageing

Section III

Measure Of Benefits

Main Benefits That The Use Of AI Could Bring To Clinical Practice

Patients Perceives A Range Of Benefits From Integrating AI In The Clinical Practice

- The healthcare workforce shortage is a major challenge for many healthcare systems worldwide, which are struggling both to find qualified employees to fill open positions and to successfully train and retain them.
- For example, a report published by the (WHO) in Sep 2022 indicated that **40% of medical doctors are close to retirement age in one-third of countries in Europe and Central Asia**.
- While **AI** cannot replace in-person relationships, **it can facilitate with admin tasks such as triaging patients, documentation, stratifying the levbl of severity of their conditions and categorizing their susceptibility to certain treatments or the automation of routine tasks**, which will give Healthcare professionals s more time that can be dedicated to direct care.
- **Increased risk of medical errors and data privacy concerns are some of the issues that require due consideration with major reputational risks for the pharmaceutical industry, physicians and the healthcare industry at large.**
- Healthcare systems will need to find a way to increase efficiency and patient treatment throughput, specifically to do more with fewer resources available, and technologies like AI can lend a helping hand.

Overall, faster and more reliable healthcare delivery, followed by the mitigation of healthcare staff shortages, were selected as the main benefits that patients associated with the use of AI in clinical practice

	Canada	UK	US	Germany	Brazil	Spain	France	India	Mexico	Italy	Japan
Mitigation of healthcare staff shortages	48%	28%	28%	50%	40%	25%	50%	61%	41%	38%	60%
Faster healthcare delivery	44%	46%	40%	37%	69%	43%	46%	59%	63%	58%	40%
Decreased healthcare costs	22%	30%	20%	31%	33%	42%	30%	48%	35%	45%	48%
More efficient preventive care	14%	36%	26%	35%	31%	21%	30%	48%	43%	18%	38%
Decreased risk of medical error	6%	20%	22%	22%	27%	25%	18%	39%	31%	13%	32%
Better access to information and medical knowledge	46%	28%	40%	44%	33%	38%	38%	30%	45%	25%	28%
Other	22%	14%	24%	13%	2%	11%	12%	2%	0%	5%	2%

Sources: Global Data.

Section III

M&A deals and partnerships

Healthcare Blue-chips Embrace AI: Recognizing The Key to Transformation (1/2)

Big Healthcare Companies Are Developing Their Own AI Solutions– Selection of a few illustrative examples

SANOFI

- French pharmaceutical company Sanofi has developed an **AI-driven app "plai" that aims to transform its operations** across manufacturing, research, and development (R&D), and other areas.
- This innovative application harnesses the power of AI to streamline processes, enhance decision-making, and improve overall efficiency within the organization.

- Merck KGaA implemented a **ChatGPT-style program**,
- The approach is to make new technologies quickly and easily accessible to employees. **myGPT,** aims to provide secure access to GPT technology
- myGPT, is for internal use such as **creating and summarizing texts**

- Eli Lilly and **BenevolentAI** used its AI-powered platform and biomedical knowledge graph to **repurpose Eli Lilly's rheumatoid arthritis drug**, Olumiant (baricitinib),
- It subsequently received label expansion from the FDA for use in hospitalized COVID-19 patients.

Sources: GlobalData.

Section IV

Open AI and Metaverse in Healthcare Industry

04

Section IV
Open AI

Chat-GPT An unprecedented Value-Catalyst In Healthcare For Both Doctors And Patients

The Integration Of ChatGPT Holds Immense Potential To Disrupt The Healthcare Sector

- The integration of ChatGPT into the healthcare industry holds great promise **in improving patient outcomes, reducing healthcare costs, and increasing medical knowledge and literacy, accuracy, specificity and reliability as well as workflow productivity.**
- Amidst the changing patient expectations, a shift in lifestyle choices, digital medical research trends, and the never-ending digital connectivity cycle coupled with the aftermath of COVID-19**, ChatGPT, this most promising Artificial Intelligence (AI) sensation from OpenAI, is revolutionizing every bit of healthcare ecosystem at lightning speed by providing human-like outputs and ongoing open communication.**
- In Healthcare specifically, people rely on ChatGPT because it can instantaneously provide precise diagnosis accuracy, customized patient care support, assistance in medical education, and clinical decision-making by seamlessly analyzing complex patient data in a multilayered, multi-parametric standardized workflow model and converting medical terminology into actionable relevant information. As **a true game-changer**, the tool drives a more proactive and agile healthcare experience by providing patients greater ownership of their own health at the intersection of sufficient guardrails and sanity checks by physicians.

CHATGPT REACHED 1M USERS IN JUST 5 DAYS, AND 100M USERS IN JUST 2 MONTHS

IMPROVING HEALTHCARE ACCESS

- Provides language translation services and enables access to healthcare information for those with language barriers.
- Ensures medical information and guidance to patients in remote or underserved areas with limited healthcare resources.
- Assists in reducing wait times for patients by answering frequently asked questions, triaging patients, and scheduling appointments.

ENHANCING DIAGNOSTICS

- The AI-driven ChatGPT analyzes large amounts of medical records, diagnostic tests, and patient histories using natural language processing capabilities quickly and helps patients extract relevant information from unstructured data.

ENHANCING MEDICAL EDUCATION VIA CHAT GPT

- Provides personalized and engaging learning experiences that cater to the unique needs of each learner with real-time assistance.
- Addresses knowledge gaps, simulates real conversation, and provides access to high-quality data sources in a safe and controlled environment which can lead to better-trained healthcare professionals and, ultimately, improved patient care.
- Summarizes complex medical papers, condensing key information, and providing concise summaries for quick reference to patients.

Sources: Global Data, Kelton.

Section IV
Metaverse

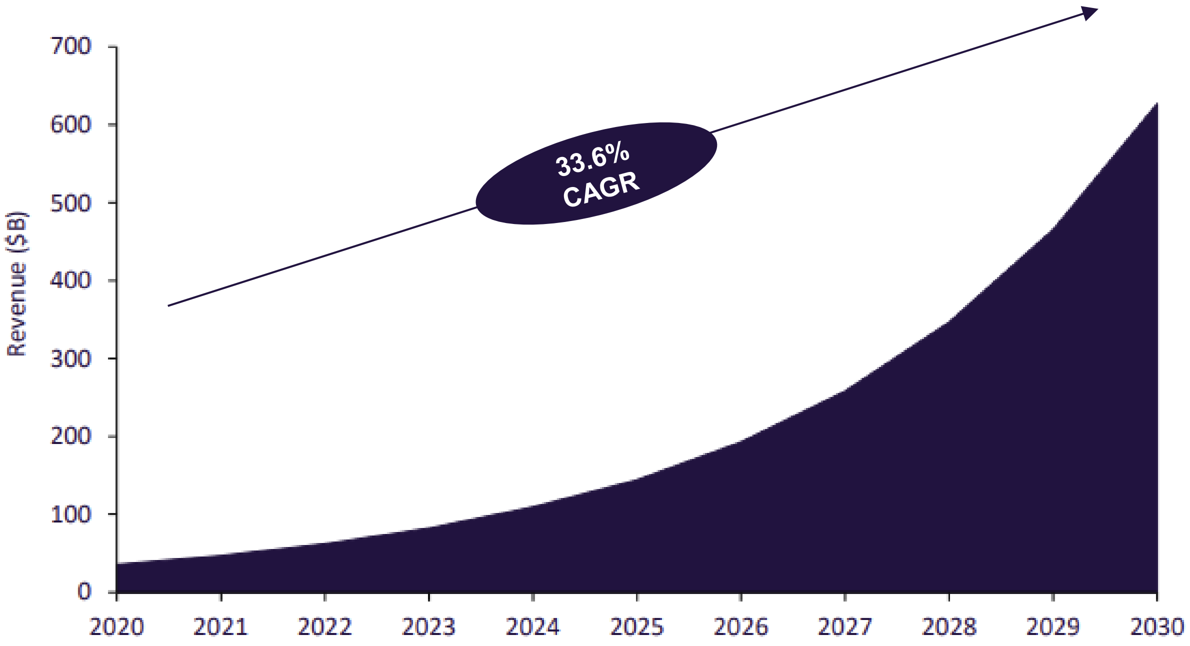
Metaverse is a major catalyst to shift the paradigm of healthcare resulting in A Surge Of Innovation And Growth (1/2)

Metaverse Revenues Are Expected To Surge 12x In 7 Years With Direct Effect On The Healthcare Sector

Market size and growth forecasts

- Remote working is clearly here to stay, as employees continue to enjoy the benefits of working from home (or anywhere, for that matter). However, there is a downside to working remotely. Zoom fatigue, lack of connection, and collaboration difficulties are just a few of the challenges that we have to overcome. Experts believe that the Metaverse offers a way of circumventing those challenges by offering a far more engaging and authentic collaboration experience.
- The metaverse boosts a range of immersive **next-generation technologies**, from **cloud computing to AI, GenAI, blockchain, cryptocurrencies, cybersecurity, Wearables and Connected implants with onboard IT IoT, VR, AR, digital twins, robotics, AI-powered 3D bioprinting, digitalized previsualization, videogaming apps and adtech**.
- Over the next decade, the metaverse's growth will depend on the speed of transformation and adoption of these underlying technologies and their ability to provide valuable enterprise use cases as well as its ability to entice patients and consumers into virtual game-changing ecosystemic models with an unprecedented level of intreractivity
- GlobalData forecasts that the **metaverse market will be worth $627 Bn by 2030**, growing at a **CAGR of 33.6% between 2023 and 2030**.

Metaverse Market Revenues, 2020-2030

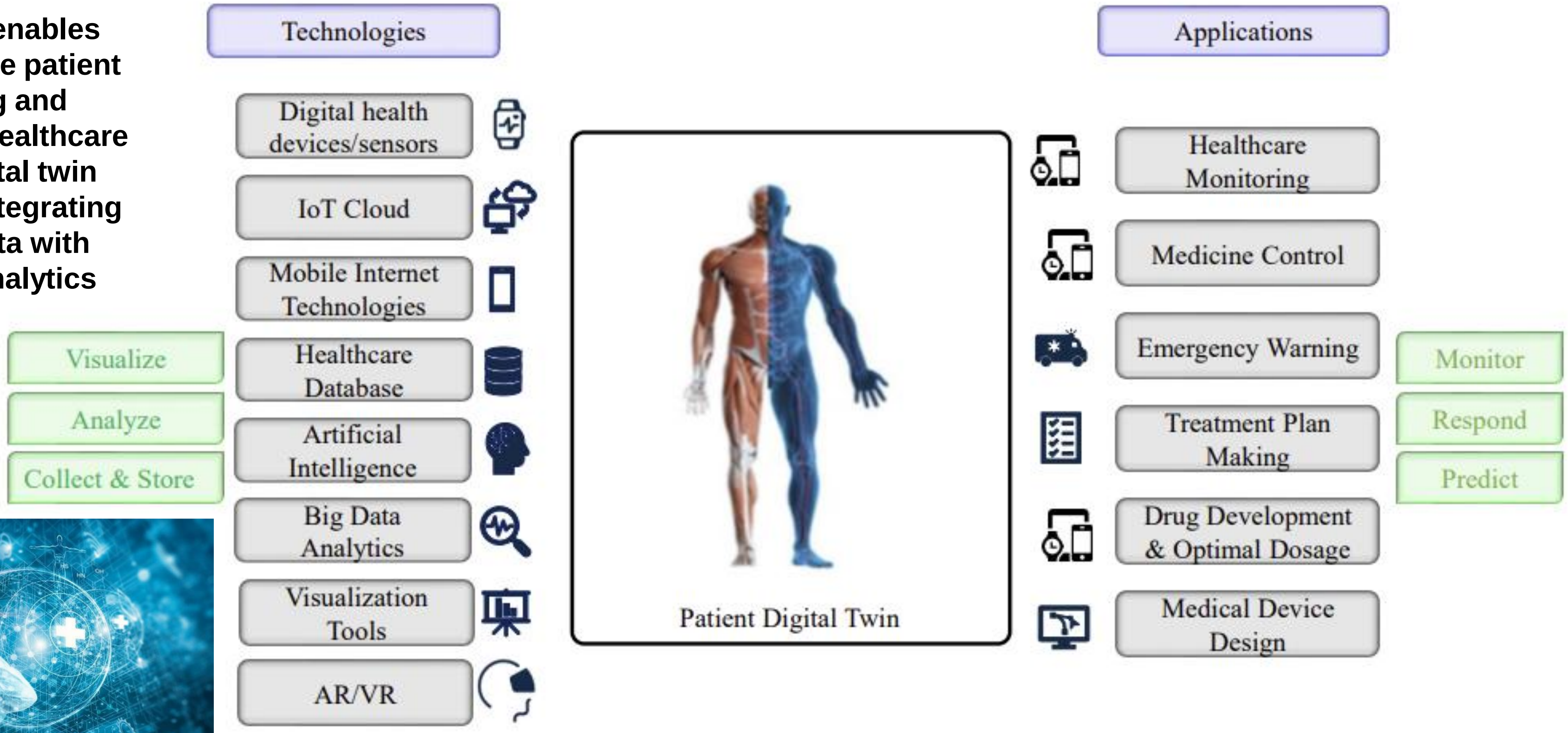


Sources: GlobalData

Pervasive new Digital Twins and Avatars propelling the advent of the Metaverse(3/4)

Technologies and applications of DT

The system enables comprehensive patient monitoring and personalized healthcare through digital twin technology, integrating real-time data with predictive analytics



Sources: Study byby Muhammad Turab, and Sonain Jamil

Section V

AI in robotics, telemedicine, telediagnostication, telesurgery

05

Industry Trends Around Adaption of GenAI In Telehealth

GenAI offers a wide range of platforms to improve quality of care and reduce wait times for patients

AI in Virtual Care

GenAI helpsin assessing patient symptoms virtually and recommend treatment plans. It also helps the provider to create personalized treatment plans, while reducing wait times for appointments, therein improving member satisfaction. With GenAI, virtual help is available 24/7, thus patients can have the luxury of accessing health records and resources whenever they want.

AI in Remote Monitoring and Consultation GenAI creates remote monitoring systems that enable continuous tracking of patient health, which is helpful for patients with chronic conditions. Patient information can be collected in real-time, including blood pressure, temperature, heart rate, and sugar levels, and these can be converted into electronic health records for providers to analyze. GenAI also helps early detection of any bigger health crisis and can call for immediate medical attention, which reduces the need for emergency or urgent care visits.

AI in Improving Accuracy in Image Diagnosis

GenAI algorithms help analyze images from CT-scan, X-rays, and MRIs very precisely to assist providers and radiologists to make faster decisions on treatment. This helps improve efficiency for the radiology department to check more patients.GenAI also enables strong collaboration among healthcare professionals for disease diagnosis by interpreting data collected through images, especially when healthcare providers are located in different places and time zones.

AI-driven Chatbots and Virtual Assistants

GenAI helps create more engaging and lively virtual environments between healthcare professionals and patients. It’s estimated that chatbots driven by AI would save healthcare organizations $3.6 billion worldwide.

GenAI can understand partial or full sentences and help with routine administrative tasks such as scheduling appointments, claim status, plan coverage, or prescribing medications. This is achieved through natural language processing and conversation algorithms. This helps workers to focus on more complex queries or handle critical issues. The implementation of AI in healthcare reduced around 20% of physician’s time in administrative tasks

AI Usage in Predictive Analytics

Electronic health records and other patient records are analyzed by AI algorithms to predict the symptoms of any developing disease or worsening condition and help providers to intervene early and create a treatment plan for the individual. Researchers at the University of British Columbia have developed an AI model capable of identifying patient characteristics from oncologist’s notes. Impressively, this model can predict cancer survival with an accuracy rate of 80%.

Sources: infosys

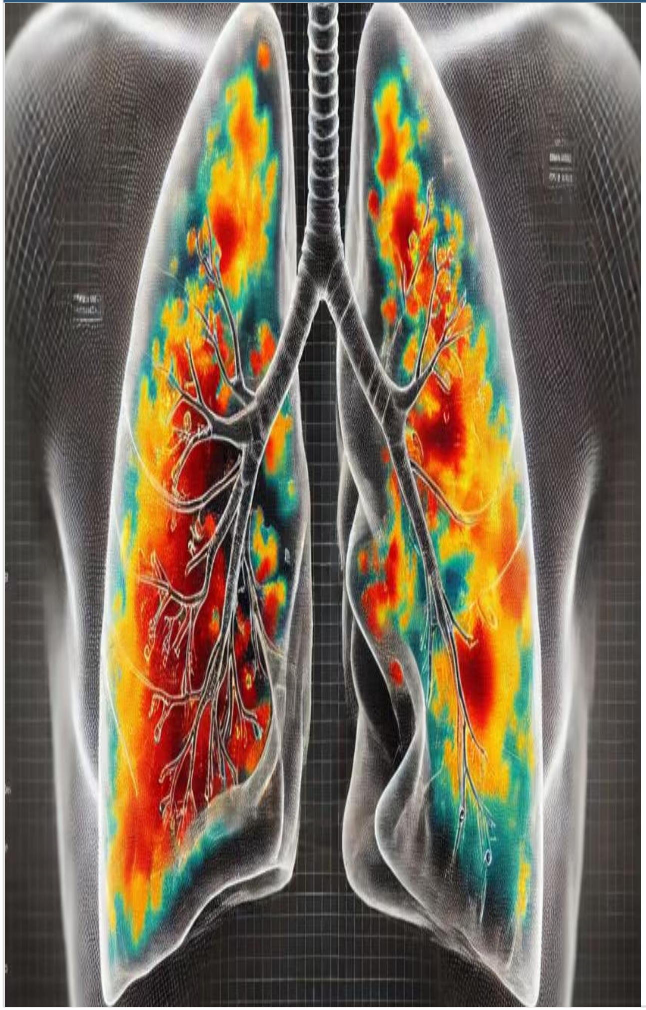
Section VI

Generative AI Use Cases in Healthcare Industry

06

Case Study on AI applied to Pneumonia

New AI picks up 97% of lung diseases, and can tell pneumonia from COVID-19



PNEUMONIA.AI PLATFORM

The Pneumonia therapeutics and diagnostics market size in 2024 were estimated at $2.5bn and $0.6bn respectively. A breakthrough **new AI model that is able to detect the presence of different lung diseases from ultrasound videos**, was developed by researchers at Australia's Charles Darwin University (CDU), United International University and the Australian Catholic University (ACU). ***Published in the journal Frontiers in Computer Science on January 24, 2025***

"Situation"

Traditional diagnostic methods, such as **chest X-rays and CT scans, can sometimes be inconclusive** or require expert interpretation, leading to potential delays in diagnosis. The emergence of **COVID-19 further complicated diagnostics,** as its symptoms often resemble those of other respiratory conditions like pneumonia.

"Solution"

This model achieves a 96.57% accuracy rate and can distinguish between conditions such as pneumonia and COVID-19. the model surpassed existing AI diagnostic tools, which currently score around 90-92%.The model also uses AI techniques to show radiologists why it made certain decisions, making it easier for them to trust and understand the results

"Impact"

The implementation of this AI model could revolutionize lung disease diagnostics by providing rapid and accurate assessments, potentially leading to earlier interventions and improved patient outcomes. Its ability to differentiate between similar presenting conditions ensures that patients receive appropriate treatments promptly.

The model also uses AI techniques to show radiologists why it made certain decisions, making it easier for them to trust and understand the results–*Niusha Shafiabady, Associate Professor at CDU*

Sources: Newatlas, Grandview research

Case Study on Novo Nordisk

Novo Nordisk Is Using Azure Devops (by Microsoft) To Decrease The Time To Bring On New Independent Research Teams

We're early in research collaboration platform (RCP) journey, but we're able to bring scientific innovation across different clinical and academic partners – *Ramneek Gupta (Digital Director in Global Drug Discovery in Novo Nordisk Research and Earlt Development)*

PHARMA.AI PLATFORM

"Situation"

Novo Nordisk Scientists and engineers work at the frontiers of discovery to defeat serious chronic diseases. The researchers frequently collaborate with external teams. For every new Novo Nordisk partner, the IR team had to provide new environment and access

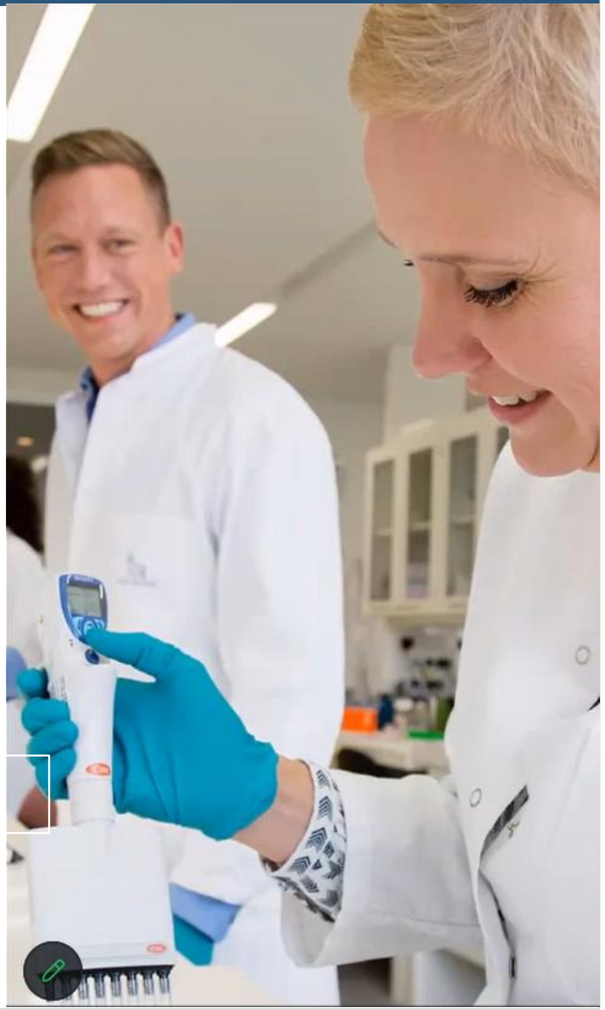
"Solution"

Novo Nordisk built a delivery platform to deploy its research collaboration platform in a multi-cloud setup on top of GitHub with integration from Azure DevOps. The fast, compliant delivery of the solution is a major benefit of teaming with Microsoft

"Impact"

The time to bring on new independent research teams has decreased from 3 tp 6 months to only several hours. Novo Nordisk can now unlock synergies in a partnership or a consortium in methos development, biological analysis and shared data science.

PARTNERS



Sources: Microsoft

Case Study on Unlearn.AI

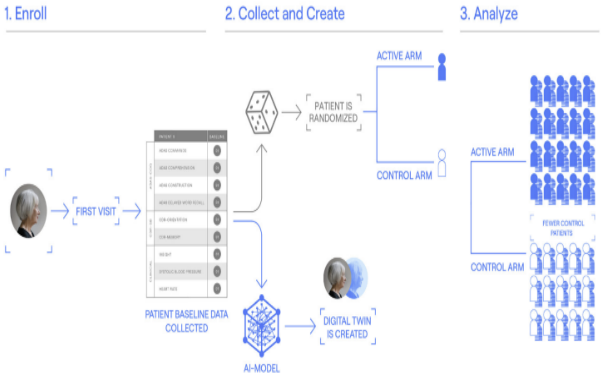
Apple In Talks To Let Google's Gemini Power Iphone AI Features

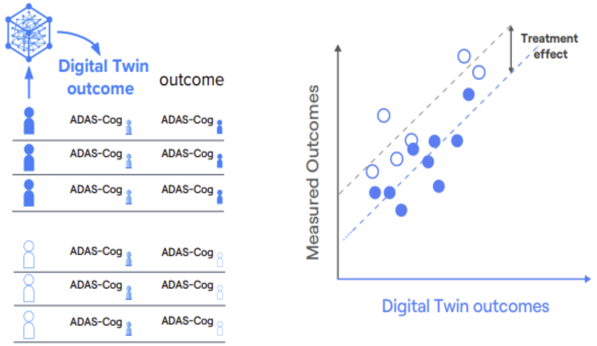
UNLEARN

PROCOVA™ is a pivotal methodology developed to integrate AI-generated digital twins into clinical trials– Charles K. Fisher, the CEO and founder of Unlearn.AI

PHARMA.AI PLATFORM

- Unlearn.AI's Digital Twin technology relies on two proprietary pipelines:
    - The first, **PROCOVA,** is a machine learning method in which historical datasets are used to identify prognostic markers and prognostic scores and produce a generative model to predict the clinical evolution of a disease.
    - The second, **Twintelligent RCTs**, is an AI-powered algorithm assessing baseline clinical records of a specific patient against the generative model to forecast a comprehensive, longitudinal clinical record that describes what would have happened if that specific patient had received a placebo.
- **This approach reduces by 30% the number of patients needed for the study.** Some real control patients are still required for a final algorithm to perform quality control which, in the absence of bias, should not be able to distinguish the real from the simulated dataset.
- PROCOVA offers a unique advantage: the generative model does not try to rationalize the survival of patients simply by using their clinical profile. Instead, it allows for the existence of known and unknown confounding variables that will always result in a mismatch between a diagnostic forecast and reality.
- By modeling uncertainty, then the AI elegantly controls this bias, and corrects it, without the necessity to fully characterize human complexity. The ability to control bias throughout the pipeline has been applauded by the FDA, which was actively involved by the developers.
- On March 22, 2022, the European Medicines Agency also released a preliminary approval for PROCOVA, allowing the use of this technology in Phase II and III trials in the European Union





Sources: Global Data, Company Information

Section VII

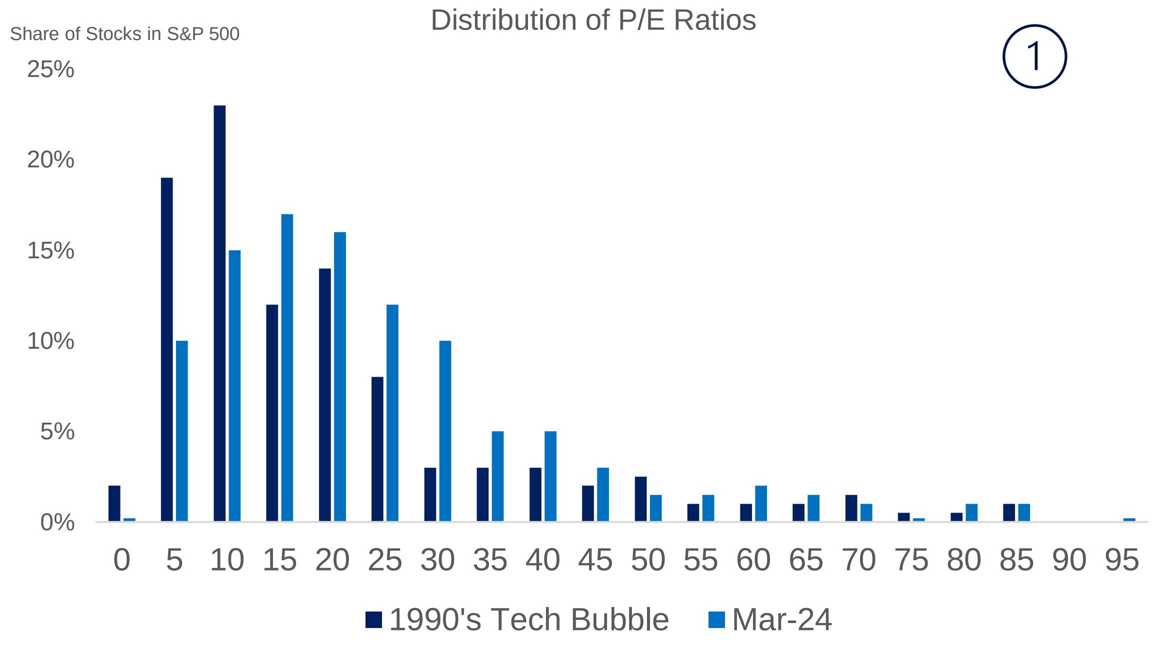
AI Market Pricing and Regulatory Framework

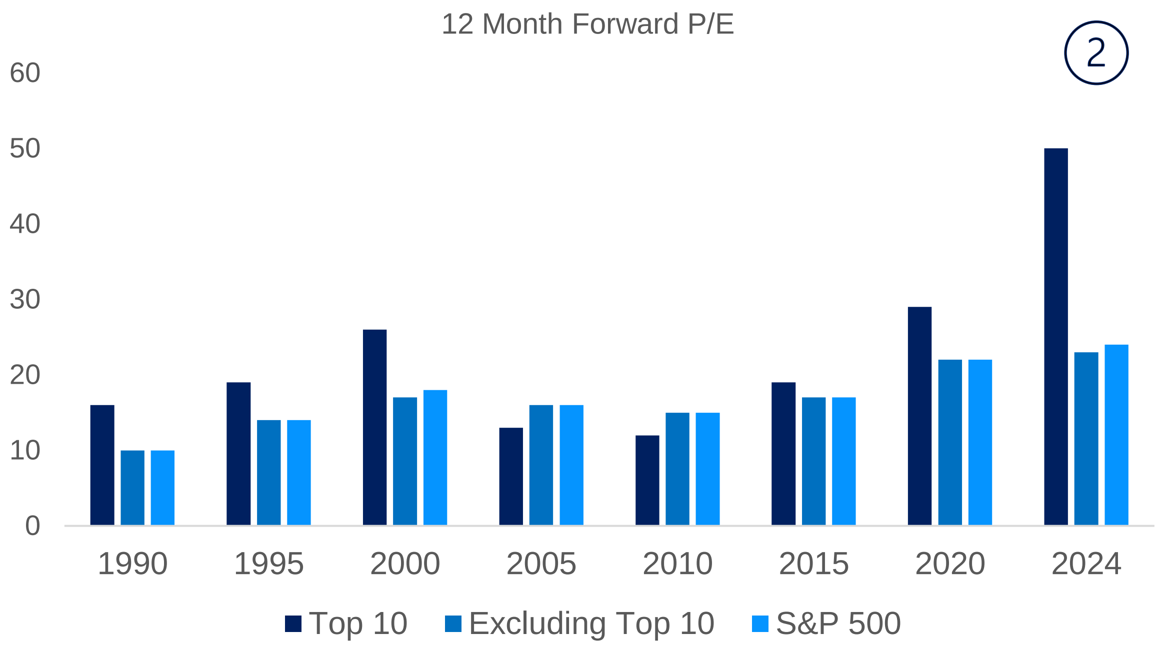
07

The Magnitude Of AI Capital Markets Overperformance Dwarfs The 1990s Tech Bubble

With PE ratio mostly common in the 15-20x range as of March 2024, AI Stocks Are More Valued Today Than During The 1990s Tech Bubble

- The distribution of P/E ratios for the S&P 500 shows that **recent "AI mania" by Investors have fueled speculations with a peak of stock price performance higher than valuation levels reached during the Tech and Millenium Bubble in March 2000**, as investors are massively driven by Fear of Missing Out – syndrome. see chart (1) below.
- **The top 10 companies in the S&P 500 today are more overvalued than the top 10 companies were during the tech bubble in the mid-1990s**, see chart (2) below.
- **The "Magnificent 7"** – Apple, Microsoft, Alphabet, Meta, Tesla, Nvidia and Amazon – **have notably led driven the prices of the S&P500, NASDAQ 100, and Major Tech indices worldwide to new unprecedented heights**. Among these "Magnificent 7" there are above all the stocks driven by the AI hype, namely chip giant Nvidia, major OpenAI investor Microsoft, and Meta Platforms, as well as Alphabet with its chatbot Gemini.
- We believe this reflects an exuberant appreciation of the amplified perception of value to be created by AI and Gen AI. Ultimately, the AI-enablement will pay off as one of the most meaningful and pervasive technological disruptions , however of a lot of this future development seems prematurely anticipated and pre-empted by overenthusiastic investors in a self-fulfilling prophecy.





Sources: Apollo

The Evolving Landscape Of AI Law And Regulation

August 1st, 2024 : AI Act enters into force

- On 1 August 2024, the European Artificial Intelligence Act (AI Act) enters into force. The Act aims to foster responsible artificial intelligence development and deployment in the EU.**The new rules are expected to serve as a global signpost for other governments in the process of regulating the fast-changing technology.**
- The new law purports **to protect citizens in the bloc's 27 member states from the possible risks associated with the fast-changing technology, as well as allow innovation to thrive.**

- **The EU aspires to be the global leader in safe AI.** By developing a strong regulatory framework based on human rights and fundamental values, the EU can develop an AI ecosystem that benefits everyone. This means **better healthcare, safer and cleaner transport, and improved public services for citizens**.
- It brings innovative products and services, particularly in energy, security, and healthcare, as well as higher productivity and more efficient manufacturing for businesses, while governments can benefit from cheaper and more sustainable services such as transport, energy and waste management.

What are the EU's new AI rules?

- The new law **categorizes different types of artificial intelligence according to grades of risk**, with strict requirements or outright bans for AI tools deemed to pose more danger.
- Most AI systems are expected to be classed as low-risk, such as models used for content recommendation or filtering spam. **High-risk uses of AI, such as in the medical field or critical infrastructure like power networks and semi-conductor industry, the building blocks of AI, will face greater scrutiny**.
- **Companies behind those models must conduct risk assessments, provide clear information to users, and ensure their products comply with the law** before they are released to the public. The data used to train their algorithms must also meet certain quality and transparency standards.
- **Real-time facial recognition in public spaces will be banned**, although there are some exceptions for law enforcement. **The law also prohibits the use of AI for predictive policing and systems that use biometric information to infer an individual's race, religion or sexual orientation**.
- Companies that violate the law can face **fines ranging from €7.5m to €35m.**

What are the EU's next steps?

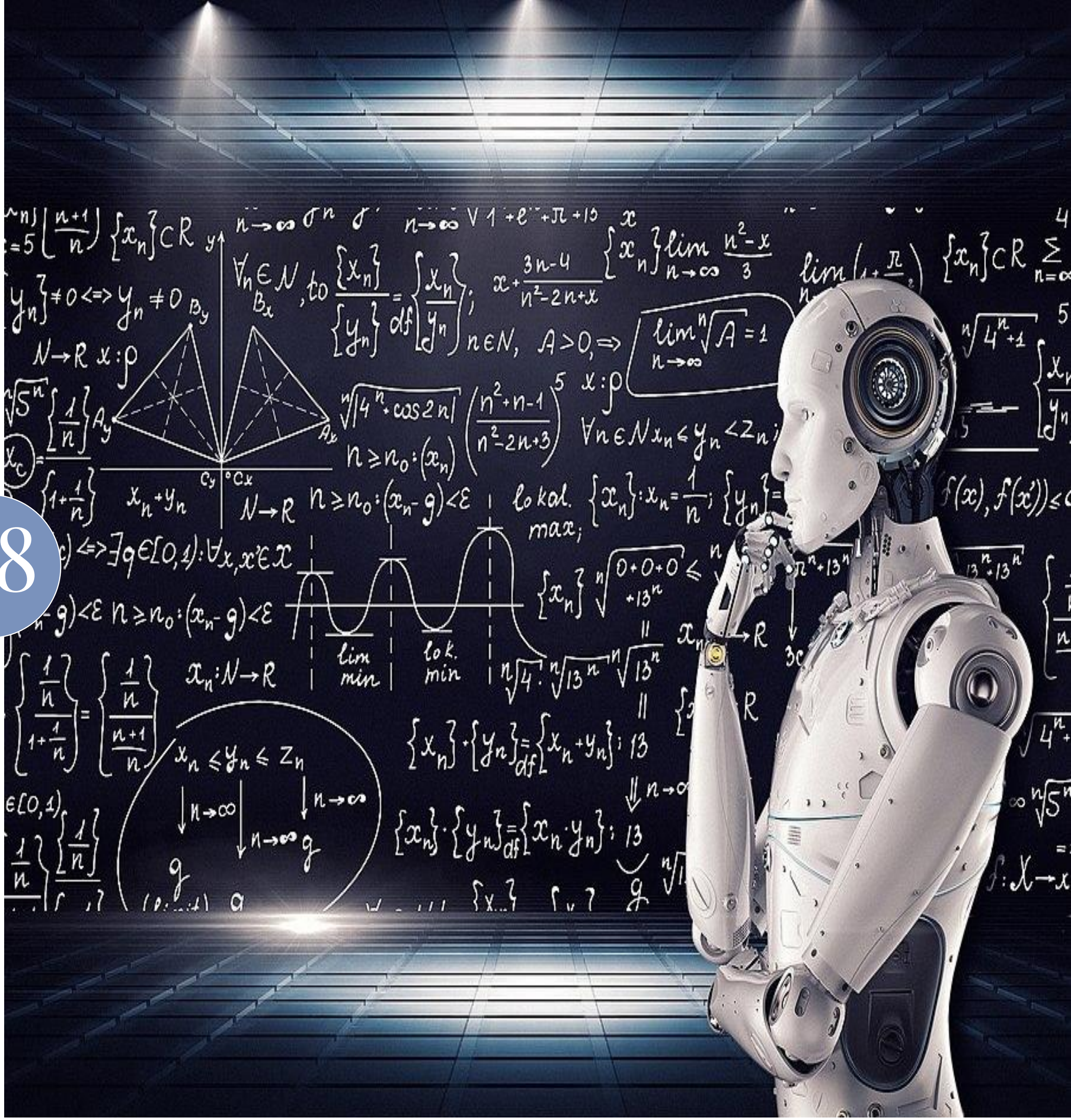
1. GPAI providers with operations in the EU, businesses, civil society representatives, rights holders and academic experts are invited to submit their views and findings, which will feed into the Commission's upcoming draft of the Code of Practice on GPAI models.
2. The provisions on GPAI will enter into application in 12 months.
3. The Commission expects to finalise the Code of Practice by April 2025.
4. In addition, the feedback from the consultation will also inform the work of the AI Office, which will supervise the implementation and enforcement of the AI Act rules on GPAI.

Sources: Deutsche Welle, European commission

Section VIII

Challenges in AI

08



IP Challenges For The Most Recently Developed GenAI Systems

Generative AI has many IP touch points and uncertainties

IP infringement

- Many generative AI tools are trained on enormous quantities (sometimes billions) of items protected by IP. There are several ongoing legal disputes alleging that the scraping and use of these works to train AI, the trained AI models, and their outputs are IP infringements. These cases are largely focused on copyright and trademarks but, in theory, other IP rights could be involved, such as industrial designs, database rights, and patented inventions.
- There is significant legal uncertainty whether AI tools, their training, use, and outputs represent IP infringements. The answer may vary by jurisdiction. Businesses and organizations should consider mitigating the risk by using IP compliant tools, seeking indemnities where possible, vetting datasets, and implementing technical and practical measures to reduce the likelihood of infringement.

Risks

1. **AI Training and IP Infringement:** Ongoing litigation seeks to clarify whether training AI on IP-protected items, using trained models, and their outputs infringe on IP rights.
2. **Liability Risks for Developers and Users:** Both AI developers and users face potential liability for IP infringement.
3. **Infringement Without Intent:** Many jurisdictions impose IP infringement liability regardless of the alleged infringer’s intent or knowledge.
4. **Unresolved Legal Accountability:** Courts have yet to determine whether AI developers, providers, or users can be held liable for IP infringement, including compensation or destruction of infringing models or outputs.
5. **Proportionality of Use Restrictions:** It remains unclear if courts would consider it proportionate to ban AI models trained on IP-protected material.
6. **Exceptions to IP Infringement:** Certain IP laws, such as fair use, text and data mining, or temporary copying exceptions, may apply to generative AI.
7. **Global Legal Disparities:** Lack of international harmonization and uncertainty regarding the application of exceptions to generative AI complicate the legal landscape.

Mitigation

1. **Use Licensed or Public Data:** Rely on generative AI tools trained only on licensed, public domain, or user-owned data.
2. **Choose Tools with Indemnities:** Select AI providers offering indemnities against IP infringement and assess their scope and suitability.
3. **Vet Training Data:** Thoroughly review training datasets to verify IP ownership, licensing, or public domain status, ensuring compliance with copyright laws.
4. **Monitor Regulatory Changes:** Track evolving regulations on disclosing IP-protected items used in AI training and maintain records of training processes.
5. **Staff Training on IP Risks:** Implement staff policies and training to minimize risks, including avoiding prompts referencing third-party IP.
6. **Check for Infringements:** Use tools like plagiarism checkers, image searches, and freedom-to-operate reviews to identify potential IP issues in AI outputs.
7. **Balance Risk and Compliance:** Evaluate the costs, benefits, and risks of mitigation measures to maintain compliance and reduce liability.

Sources: WIPO

IP Challenges For The Most Recently Developed GenAI Systems

Generative AI has many IP touch points and uncertainties

<u>IP rights in and ownership of AI outputs</u>

- It is unclear whether new content generated by AI tools such as text, images, or other creative works, can be protected by IP rights, and if so, who owns those rights. Even if AI output is not IP protected, there may be contractual provisions that govern its use.
- The existence and ownership of IP rights in generative AI outputs is unclear.
- Businesses and organizations should seek contractual clarity over ownership and consider using generative AI only in cases where IP ownership in the outputs is not crucial for their business model.

Risks

1. **Legal Uncertainty:** Most IP laws were not designed with generative AI in mind, creating ambiguity about whether AI outputs can have IP rights and who owns them.
2. **Trademarks vs. Copyright:** While trademarks are less affected, there is significant uncertainty around copyright, particularly for AI-generated works.
3. **Patent Challenges:** Patent applications naming AI systems (e.g., "DABUS") as inventors have been rejected globally, as no human inventor is identified. It remains unclear whether AI can create patentable inventions without human involvement.
4. **Copyright and Human Input:** The US Copyright Office requires a human creative contribution to register works with AI-generated material. A user's text prompt alone may not suffice. However, China's Beijing Internet Court ruled that users can own copyright if their adjustments to prompts reflect their aesthetic choices, highlighting global inconsistencies.
5. **National Approaches:** Some countries, like India, the UK, and South Africa, recognize copyright in "computer-generated works" without human authors, while Ukraine grants rights to "nonoriginal objects" generated by AI, illustrating diverse legal interpretations worldwide.

Mitigation

1. **Understand Ownership:** Review the terms and conditions of generative AI tools to determine intellectual property (IP) ownership of the outputs.
2. **Enhance Control Over Outputs:** Incorporate IP elements like brand names, logos, or human creativity to assert control or rights over the generated outputs.
3. **Human Contribution:** Document the role of human involvement in the creation or invention process to strengthen claims of originality or authorship.
4. **Establish Agreements:** Where applicable, create agreements that clarify ownership of copyright in computer-generated works to avoid ambiguity, especially given varying legal standards across jurisdictions.
5. **Warranties in Commissioned Work:** When commissioning outputs, seek warranties ensuring generative AI was not improperly used.
6. **Limited Use Cases:** Use generative AI primarily in contexts where IP rights are less critical, such as internal tasks, idea generation, or ephemeral content like personal social media posts.

Sources: WIPO

WINDOME

BANKING PARTNERS

PARIS, SAN FRANCISCO

JEAN-YVES COSTE
FOUNDER, CHAIRMAN AND PARTNER

JYCOSTE@WINDOME-BANKING.COM
+33 6 21 82 95 48

FLORIAN PUCHLY
FOUNDER, CEO AND PARTNER

FPUCHLY@WINDOME-BANKING.COM
+33 6 99 39 20 10

NADIM RAAD
SENIOR ASSOCIATE

NRAAD@WINDOME-BANKING.COM
+33749277873