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Executive summary

We expect the AI market to grow from \$81B in 2022 to \$909B by 2030, with a 35% CAGR 2022-30

- Of the **five advanced AI technologies** receiving the most attention today, **generative AI (“creation” in our AI value chain)** is the fastest growing
- This executive briefing focuses on generative AI, but on slide 18 our experts offer a framework for looking at every segment of the AI value chain
- Generative AI is likely to pose a threat to **every business across every sector** in the coming years
- The **impact** will expand across sectors and business functions as generative AI becomes more accurate and is able to provide reliable factual advice
- Use cases** range from customer support chatbots, and news and marketing content creation, to code writing and product design
- GlobalData Thematic Intelligence can help you devise a **comprehensive** AI strategy

Related reports

- [Artificial Intelligence](#)
- [Monthly disruptor roundup: Generative AI 2023](#)
- [Innovation Radar – Text-to-X](#)
- [Generative AI Watch](#)
- [ChatGPT trailblazers](#)
- [Machine Learning](#)
- [Computer Vision](#)
- [AI Chips](#)

Recommendations for management	Priority
Launch an internal process review to determine opportunities and risks of generative AI at process/task level (focus on tolerance for accuracy, need for factual advice, and product substitution potential)	High
Set company’s view on expected timeframe for i) accurate generative AI and ii) arrival of full substitutive AI (AGI)	Medium
Define full AI adoption strategy considering future scenarios (particularly i) and ii)	Medium
Define corporate policy to acquire generative AI capabilities (organic, partnership, off-the-shelf)	Medium
Understand regulatory framework particularly as it relates to data privacy and intellectual property ownership	High
Launch generative AI pilot projects to learn and understand technology	High

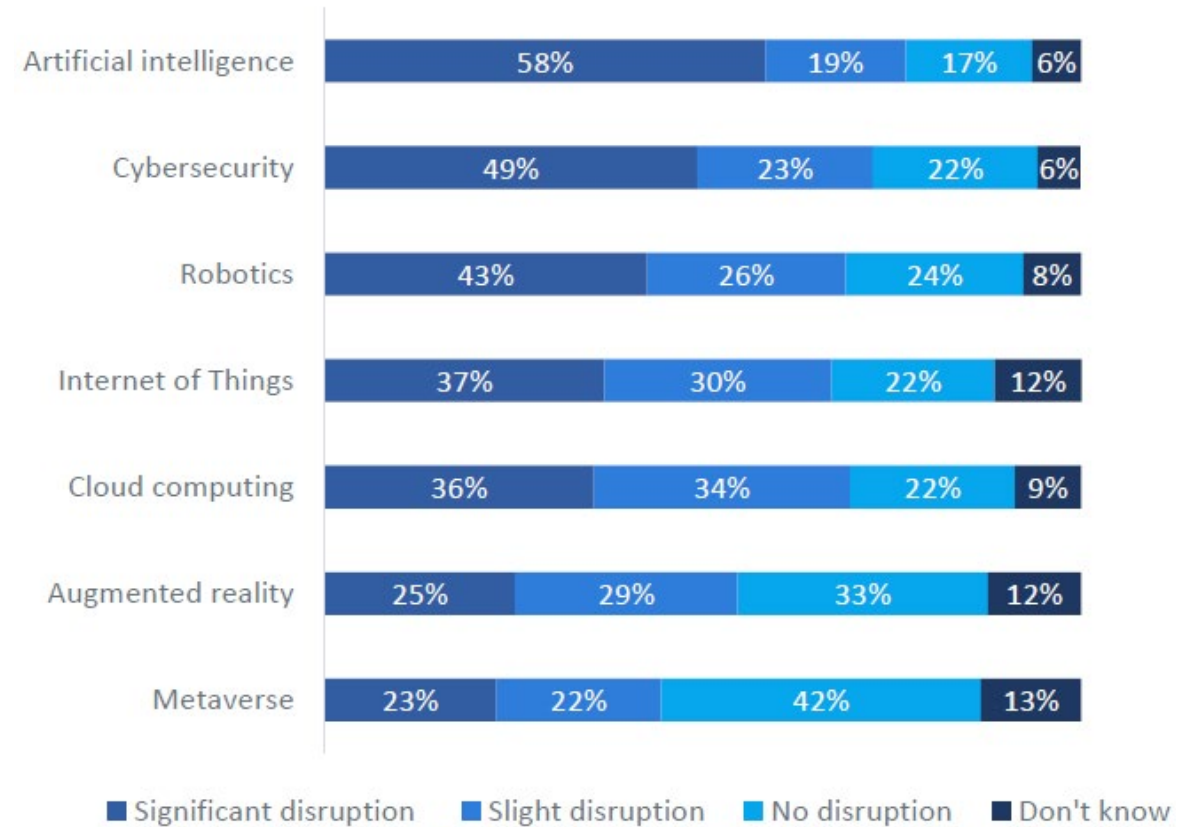


Over three-quarters of respondents expect either slight or significant AI disruption

How much will the following technologies disrupt your industry?

In Q1 2023, AI held steady as the technology perceived to be the most disruptive. It has maintained the top spot in this poll since Q3 2021.

Level of disruption by technology, Q1 2023



Respondents: 357
Source: Verdict media
Ended: Feb 27, 2023



Considerations for enterprise management



The mass appeal of generative AI lies in its **potential** to perform tasks that existing AI applications have not yet been able to master. The ability to write code, generate training data, or create natural-sounding text opens the door to a range of potential horizontal and **industry-specific applications yet to be discovered**.



Enterprises will need to decide **which model** will work best with their specific use case, whether they will need to use multiple LLMs depending on their applications, and how much **customization** will be required to make the model work for their use case(s).



Organizations looking to scale their use of AI to include generative AI should implement **multi-disciplinary** AI and Ethics teams that evaluate new AI use cases and ensure they adhere to **corporate ethical standards**.



Enterprises should ensure that **human oversight** is included as a critical step in operational processes that leverage generative AI.



Organizations evaluating generative AI should look for solutions that include model **explainability** so that users understand the sources of information used to create output and can ascertain their credibility.



Multiple countries are assessing the potential threat posed by the technology to individual privacy and its potential unwanted outcomes. Organizations will need to ensure that they are adhering to **ethical and legal requirements** on a local, national, and international scale around AI.



Considerations for IT decision makers

Enterprises exploring generative AI should consider multiple criteria when evaluating solutions

Brand reputation

Generative AI is already being made available via enterprise-grade platforms and tools by trusted technology partners, in response to the controversy and confusion swirling globally on the new technology's trustworthiness. Customers are asking for 'chaperoned' solutions that include guardrails offered by known brands.

Strength in security

Enterprises are concerned that their proprietary data will unintentionally end up in the public realm or be inadvertently used to train large language models, and therefore be accessible to others. Solution providers must ensure the security of enterprise data and customer information.

Ecosystem strength

Strong ecosystem partnerships between trusted technology providers (as mentioned) and advanced AI services by start-ups/pure plays with important innovations are all part of a trusted and cohesive partner program backed by leading cloud platform providers, global SIs, and SPs. Solutions that provide a seamless, end-to-end user experience and easily integrate with an enterprise's existing IT environment will facilitate the adoption of generative AI.

Explainability

Explainable AI, such as understanding the sources used to produce generative AI content, is essential for enterprises to trust model results and take meaningful action based on findings.

Advanced data architecture

Data management capabilities, such as data fabrics and other solutions, that reduce data silos and streamline access to information across data repositories, provide a more efficient and consistent experience to data professionals involved in deploying advanced analytics projects.

Go-to-market strategy and professional services

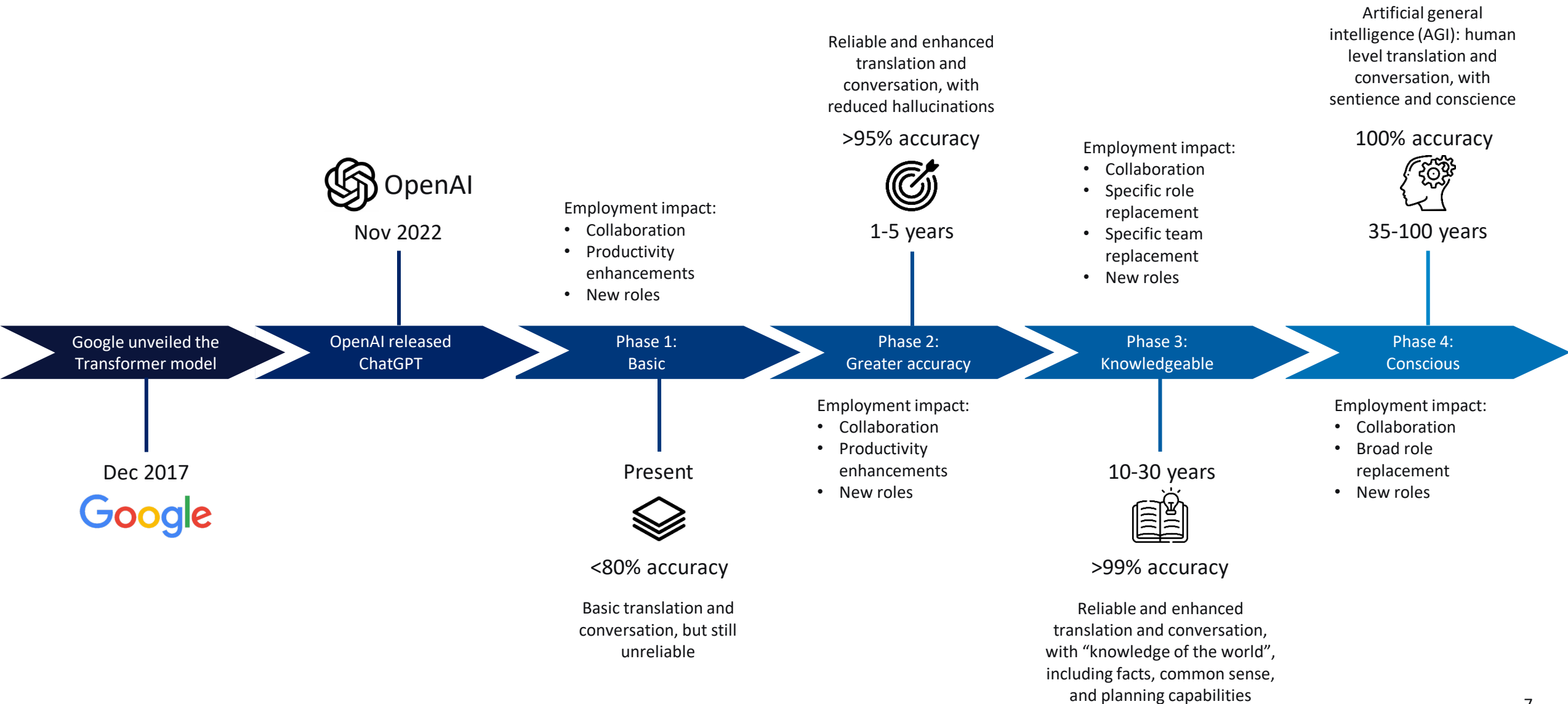
A vendor with a strong base of reference customers, and pricing models that address flexible consumption are critical to new users. At the same time, deploying a generative AI solution can be a complex task, even for organizations with extensive in-house resources. Buyers should look for providers that have a team of experts available to help them navigate the process.

Performance

As the market evolves and organizations begin to rely on generative AI, they will look for solutions that consistently demonstrate low latency and reliability, produce diverse results, successfully preserve meaning and intent, secure enterprise data, and offer filters that act as guardrails.



Key phases in the development of generative AI



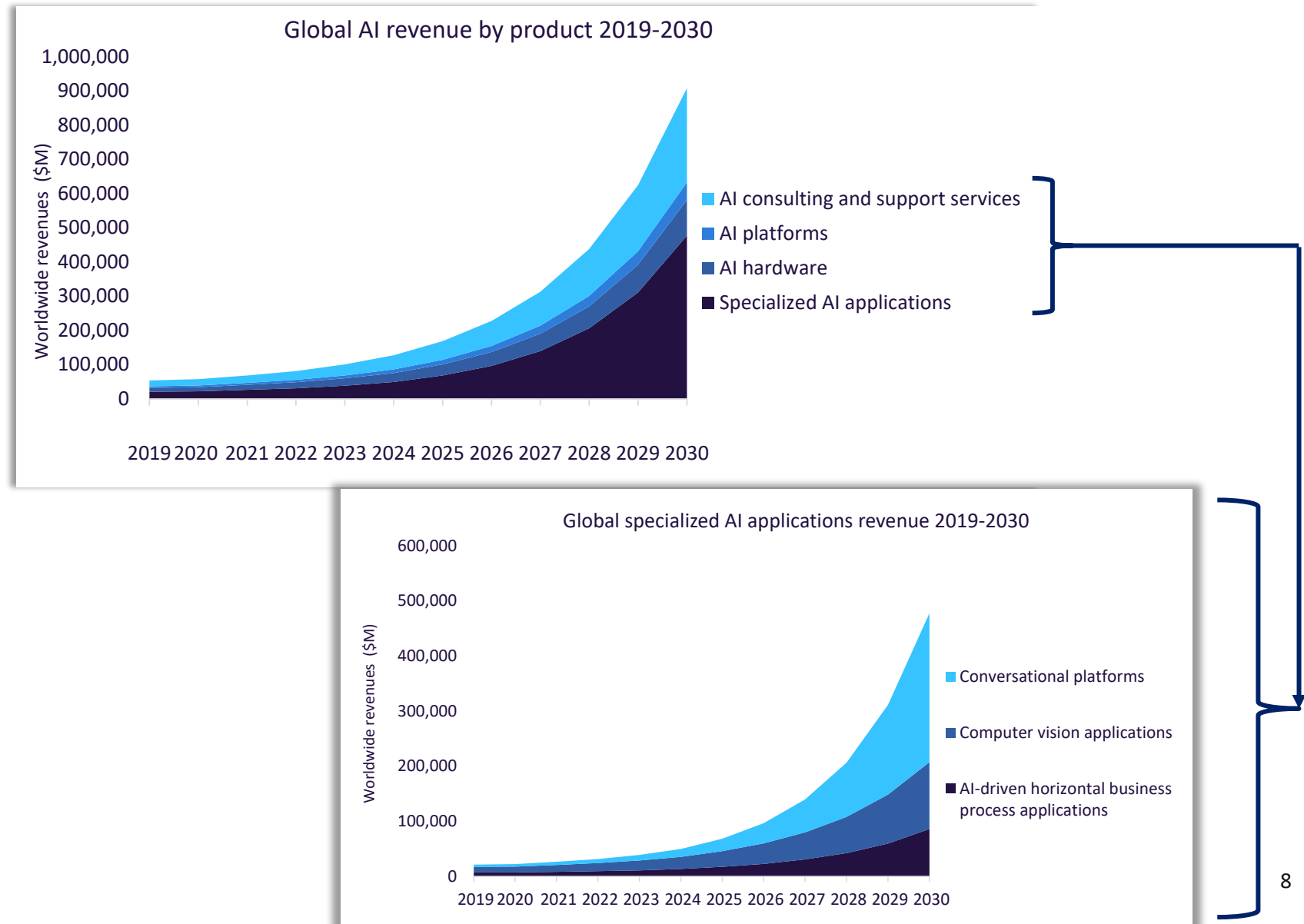


Our artificial intelligence market forecast

A dream of humanity for centuries, AI has the potential to fuel the next industrial revolution

- Recent progress in machine learning (ML) on the back of improved algorithms and increasing computing power have made it possible for AI to solve real-life problems.
- GlobalData estimates the total AI market will be worth \$908.7 billion in 2030.
- Within that the global specialized AI applications market will be worth \$477.6 billion in 2030, up from \$31.1 billion in 2022.
- In the early years AI investments will be dominated by computer vision and conversational platforms

Source: GlobalData

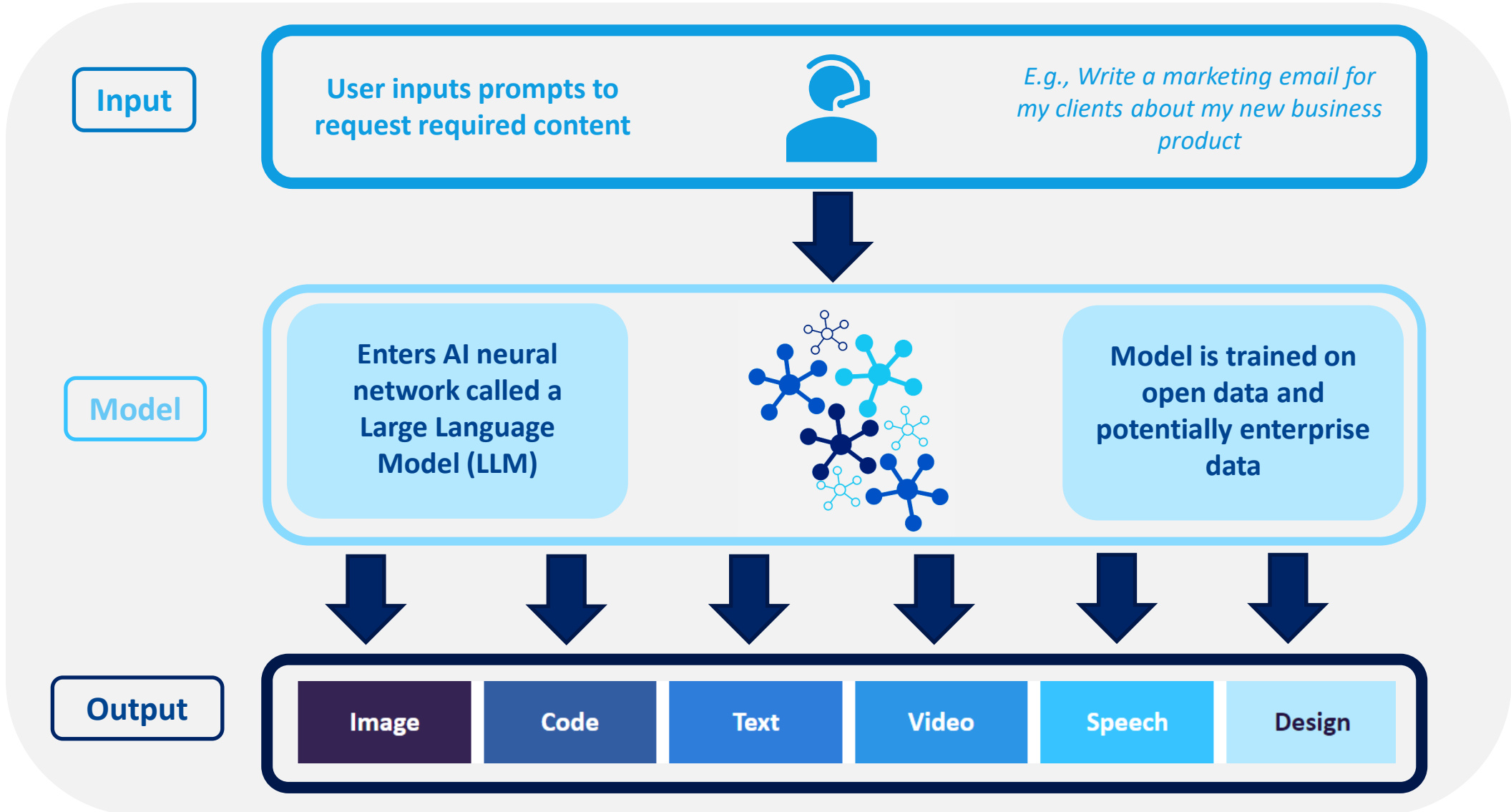


Generative AI overview



What is generative AI?

Generative AI is a type of foundational AI technology that uses machine learning algorithms to create content, including text, images, audio, video, speech, design, and software code



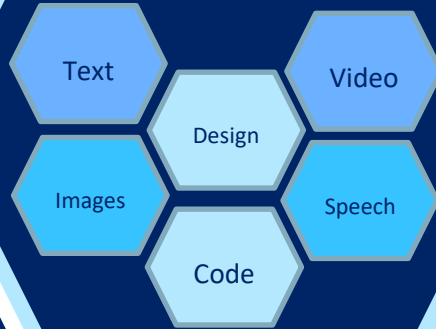


The fundamentals of generative AI


What do we mean by 'creation'?

'Creation' can be simply defined as the ability of an AI system to **produce content on request.**

This content can include:



ello to the readers of GlobalData's Artificial Intelligence Executive Briefing and summarise w... e in one sentence.

 Hello, esteemed readers of GlobalData's Artificial Intelligence Executive Briefing.

I am ChatGPT, an advanced AI language model designed to assist and engage in conversation, offering valuable insights and information related to various topics, including artificial intelligence.

Some key players in this space include:

 Meta AI



Midjourney

 OpenAI



Bard AI

NightCafe
ART VIA ALGORITHM

 Google Brain

Generative AI is usually based on a type of neural network called a **Large Language Model (LLM)**



Large language models (LLMs) can generate many types of content

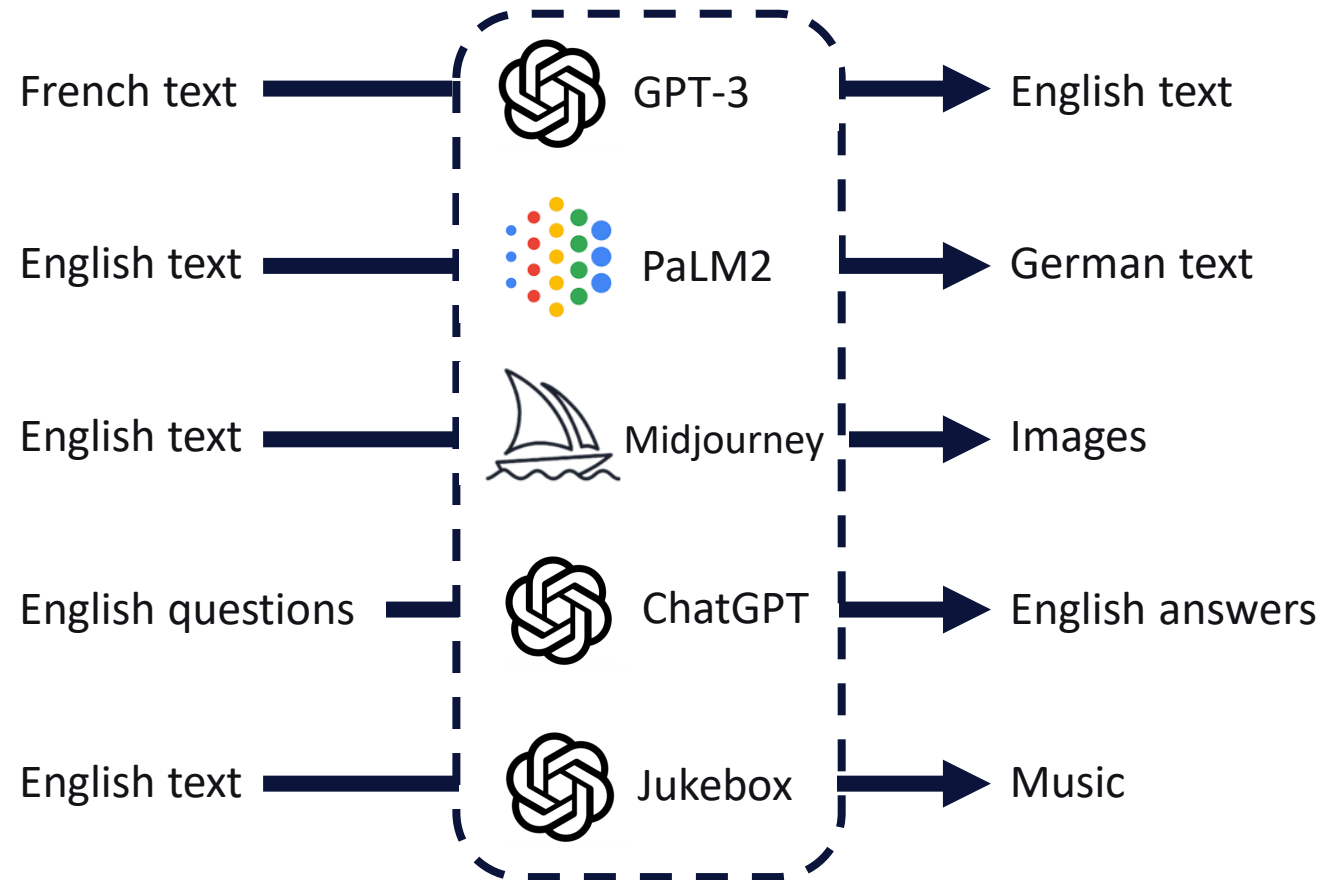


Neural networks can learn to 'translate' from language A to language B. However, the definition of 'language' is quite flexible.

As such, LLMs are applicable to many scenarios including:

- Translation
- Conversation
- Visual generation
- Music generation

AI practitioners use the term 'sequence transduction' instead.

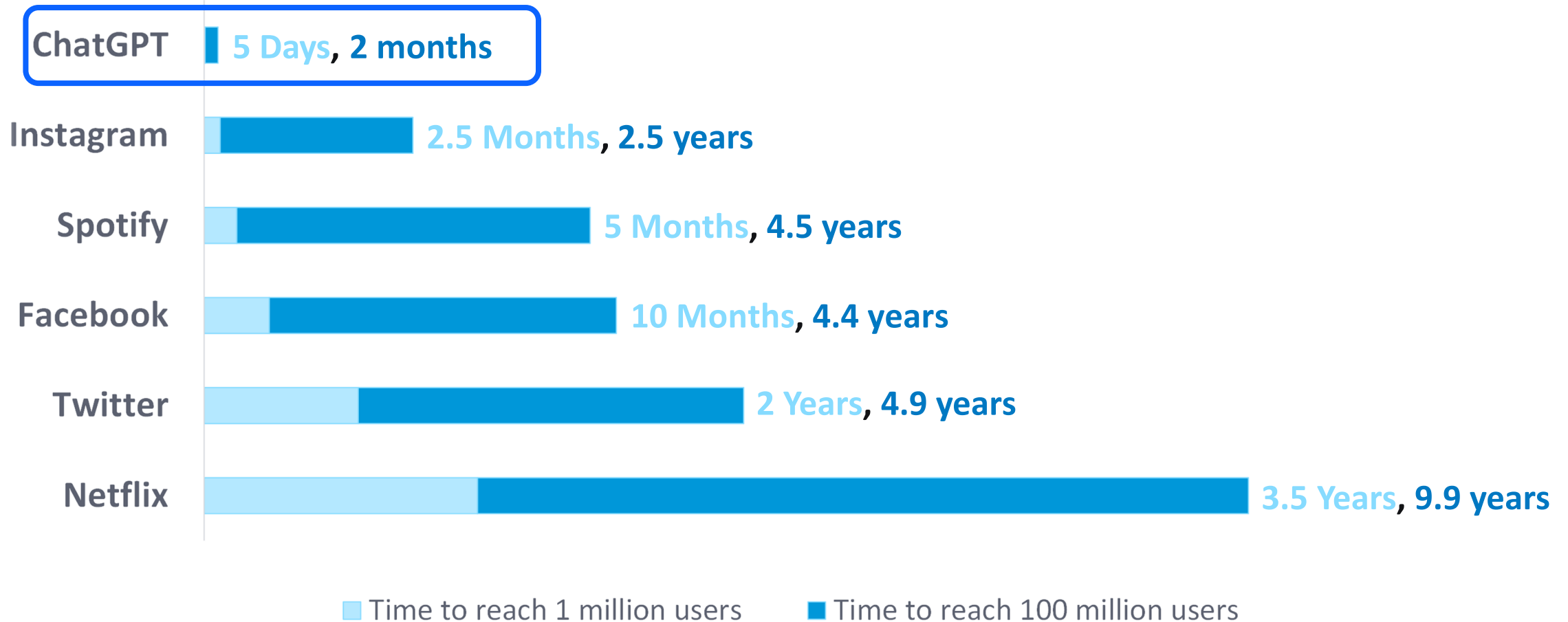




Generative AI has grown faster than any other technology

Generative AI will upend and transform businesses across sectors with lasting impact

ChatGPT was the first to reach one million and 100 million users





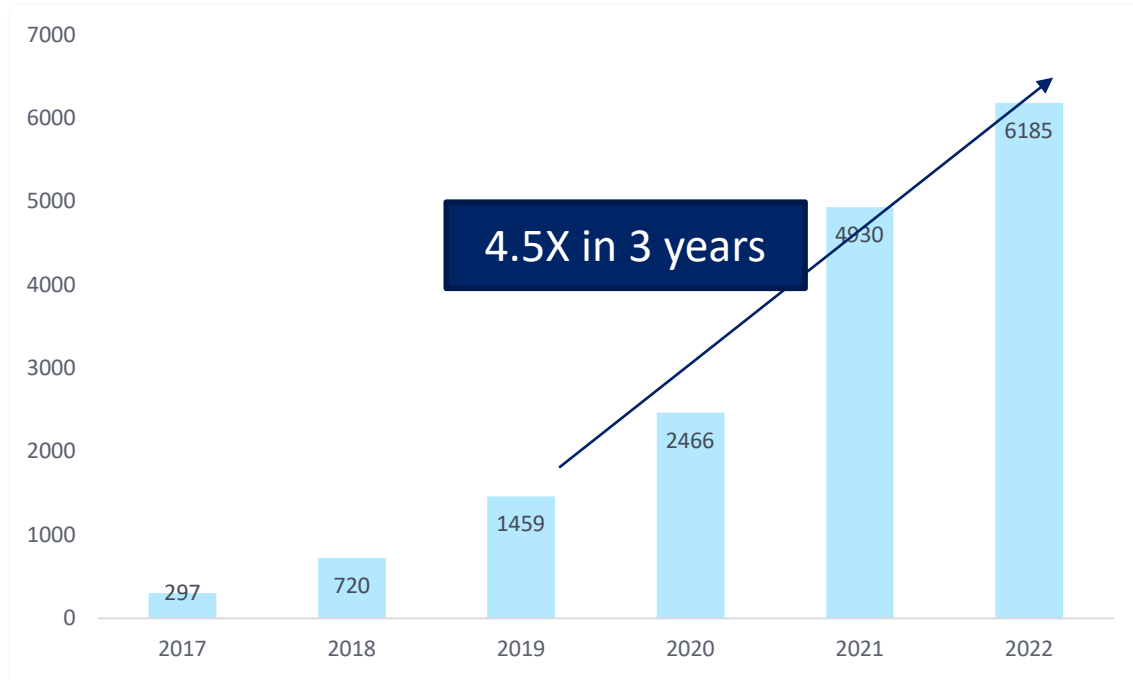
Generative AI - a major inflection in 2020, taking the world by storm in 2023

What is generative AI?

Generative AI refers to a category of artificial intelligence techniques and algorithms that are designed to generate new data or content that is similar to what it has been trained on. This can include text, images, videos, music, and other types of content. Examples of generative AI include image and video synthesis, text generation, music composition etc.

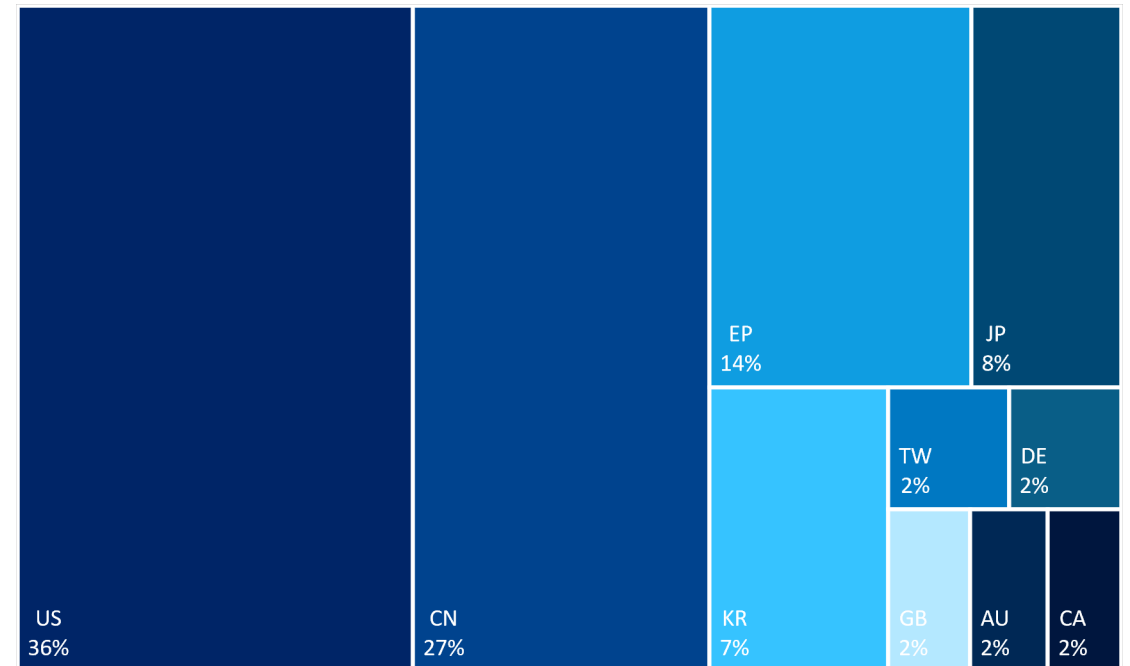
Patent filing trends in generative AI

83% CAGR in last five years



Patent filing trends in generative AI

US leads the race, followed by China and Europe

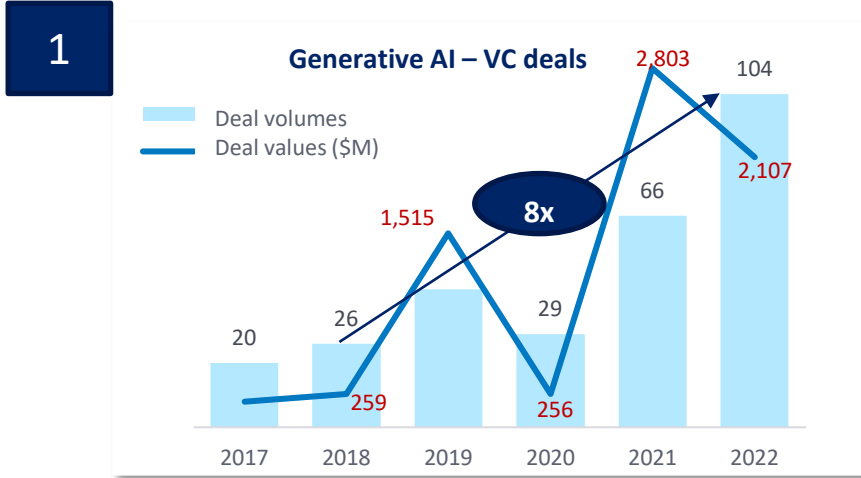


Source: GlobalData Patents Analytics

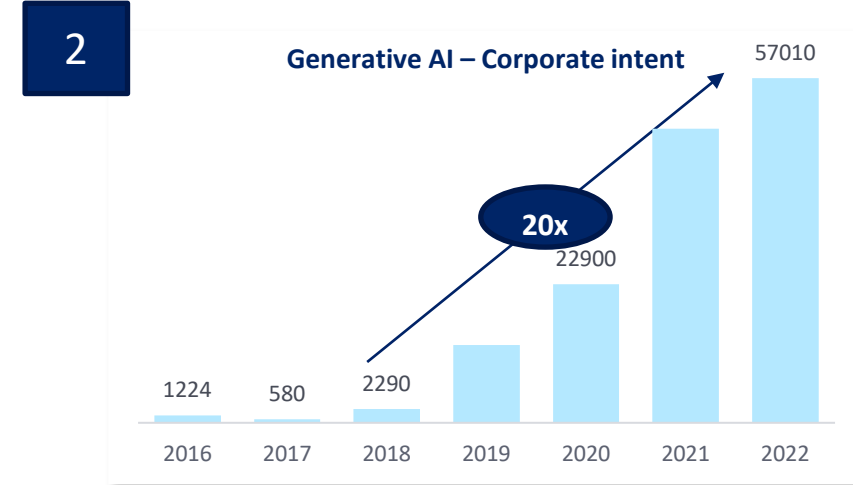


Generative AI - exploding adoption trends

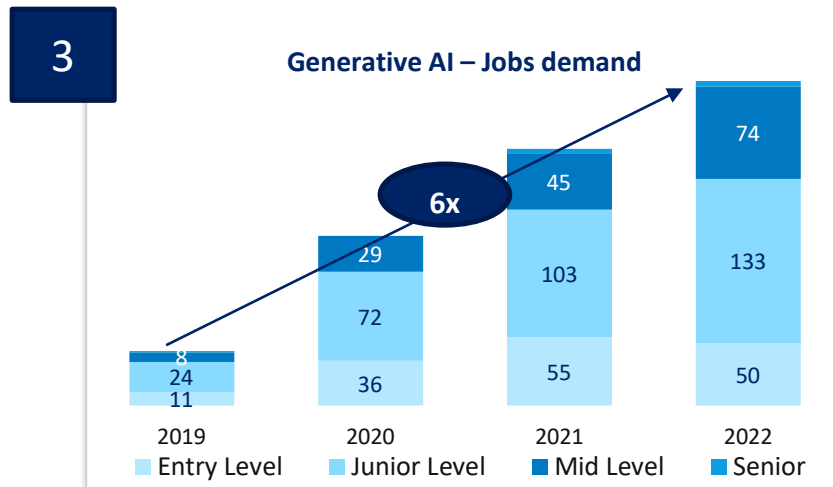
Start-up funding rises exponentially, feeding more disruption and innovation...



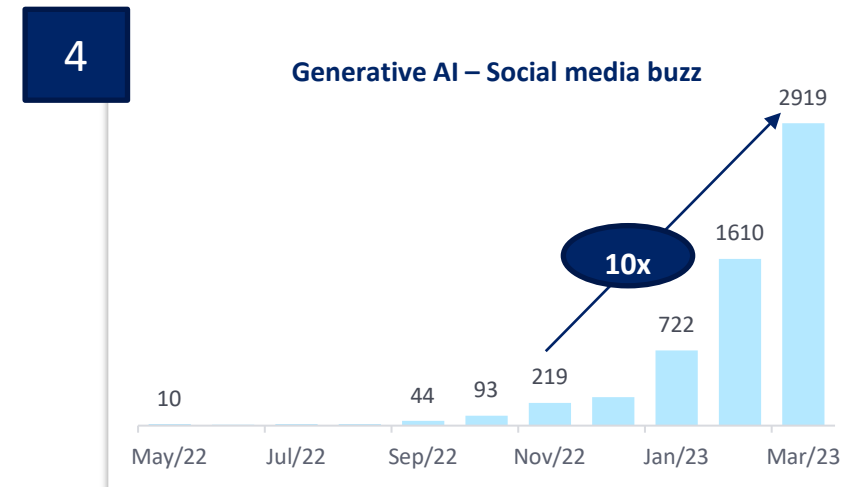
...and corporate entities also showing accelerating intent for application in business...



...backed by increasing demand for human capital to capitalize on the opportunity...



...reflected in rapidly increase in interest on social media platforms...



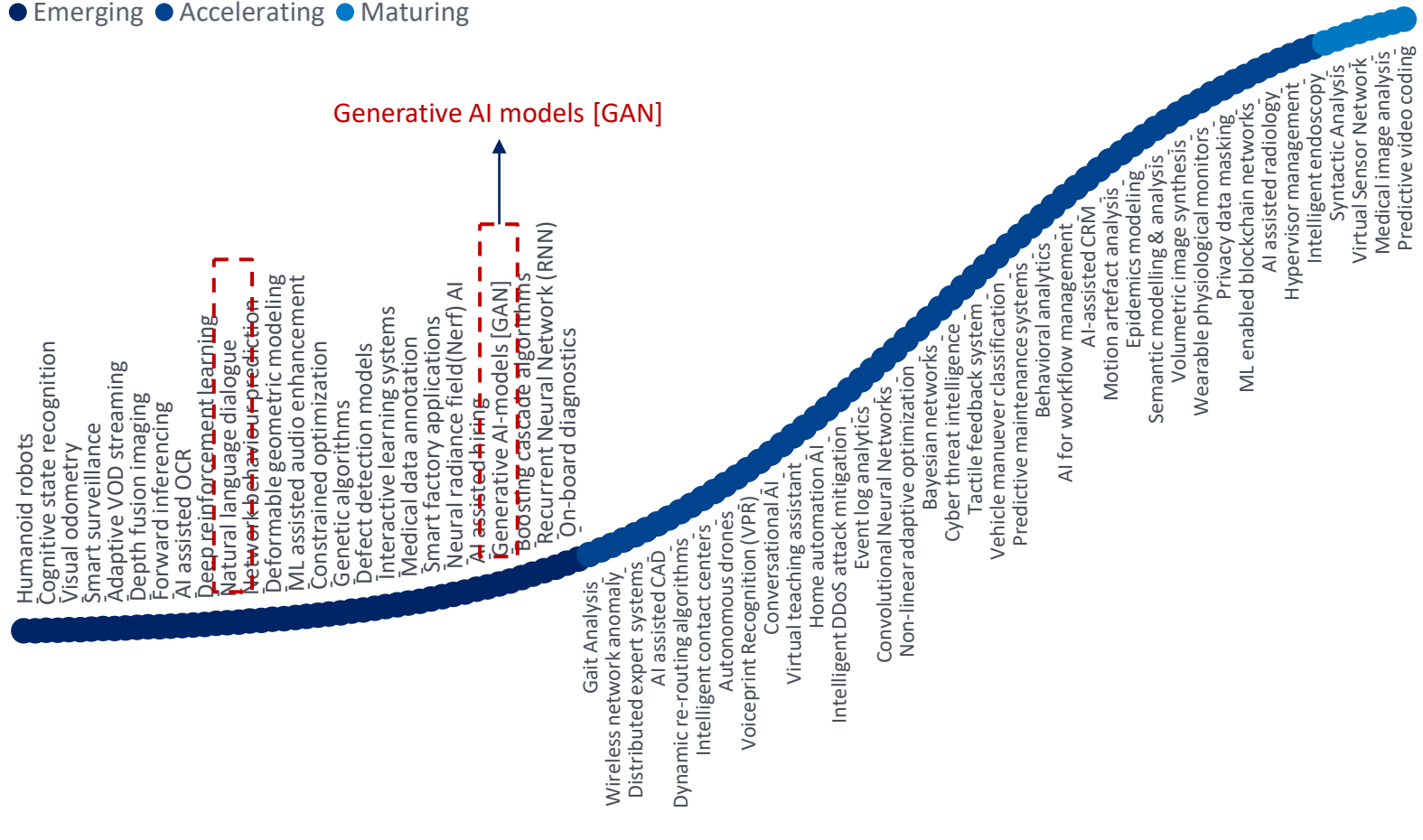


Generative AI is just one of multiple AI innovations

Generative AI has earned a place alongside other cutting-edge, increasingly disruptive AI applications

AI - innovation s-curve

● Emerging ● Accelerating ● Maturing



- Emerging innovations:**
- Generative AI-models
 - Genetic Algorithms
 - AI-assisted audio enhancement
 - Neural-radiance field (Nerf-AI)
 - Network behaviour prediction

- Accelerating innovations:**
- Voice-print recognition
 - Home automation AI
 - NLP Deductive Database
 - AI-assisted CRM

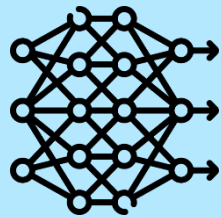
- Maturing innovations:**
- Facial recognition
 - Smart content queueing
 - Medical image analysis
 - Smart lighting



How did AI creativity come about and why now?

How did we go from linear regression to creation?

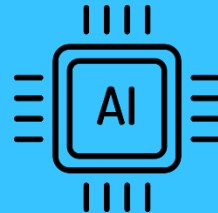
Three important developments led us here:



The Transformer deep learning model

The Transformer deep learning model was designed by a team at Google in 2017. It addressed two key limitations of prior deep learning models for language:

- The lack of parallelism, or the ability to compute multiple parts of a deep learning model simultaneously
- Determining which words in the original sentence are more relevant



Advances in AI chips

- AI chips have been optimized in a few areas including memory and parallelism.
- This has materially sped up deep learning model computations, allowing for AI creativity.



The phenomenon of 'emerging abilities'

- These are new abilities that the model has not been specifically trained to do.
- These only emerge in larger models.
- We do not know how they emerge so cannot be predicted or controlled.

See [\(slide 60-63\) in appendix](#) for further detail



Advanced AI capabilities

There are five advanced AI capabilities; Creation, or Generative AI, is one of them

Human-AI interaction includes:

- Computer vision and conversational capabilities
- Less developed artificial senses such as smell, taste, and touch
- Non-natural senses such as brain-machine interfaces

Decision-making includes:

- Identifying, recognizing, classifying, analyzing, synthesizing, forecasting, problem-solving, and planning
- Symbolic ai and neural networks can be used to perform these tasks
- A combination of the two will be required

Sentience includes:

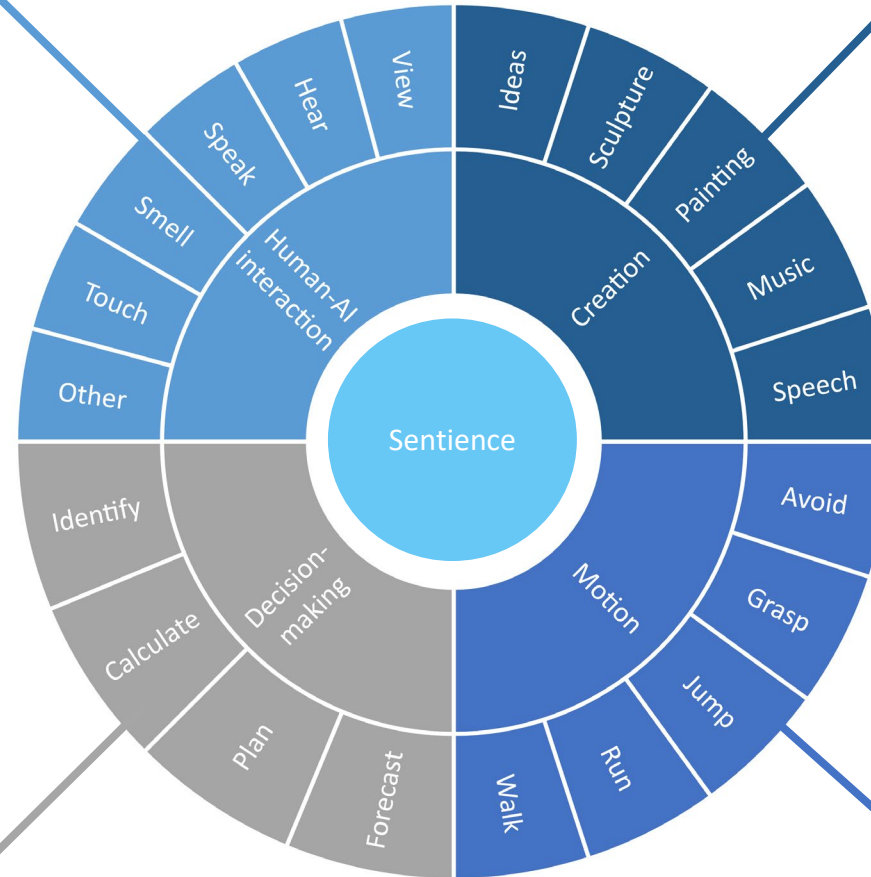
- The emergence of self-awareness or consciousness, the ultimate expression of intelligence in an artificial system; however, this is far from achievable for now

Creation includes:

- Traditional media such as audio, video, and text
- Industry specific uses such as software code, molecular structures, or AI itself (self-creation)

Motion includes:

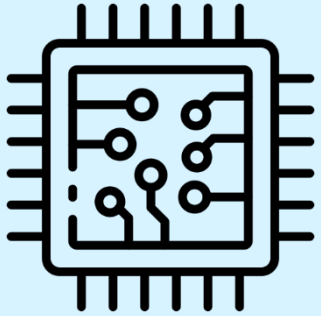
- The ability to move and interact with the world
- Motion is a complex capability that requires significant intelligence



Full AI value chain



At GlobalData we cover everything in the AI value chain, from semiconductors to application software



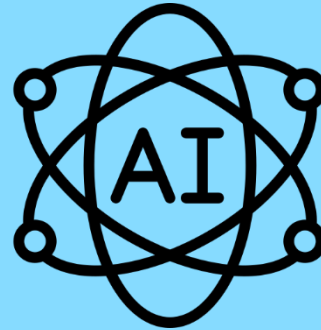
Hardware

- Semiconductors
- Cameras
- Sensors and lasers
- Servers
- Storage devices
- Networking equipment
- Edge equipment



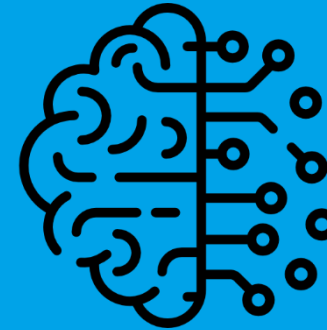
Data management

- Data governance and security
- Data storage
- Data processing
- Data aggregation
- Data integration



Foundation AI

- Data science
- Machine learning
- 3D modelling
- Knowledge representation and reasoning
- Visualization engines



Advanced AI Capabilities

- Human-AI interaction
- Decision-making
- Motion
- **Creation**
- Sentience

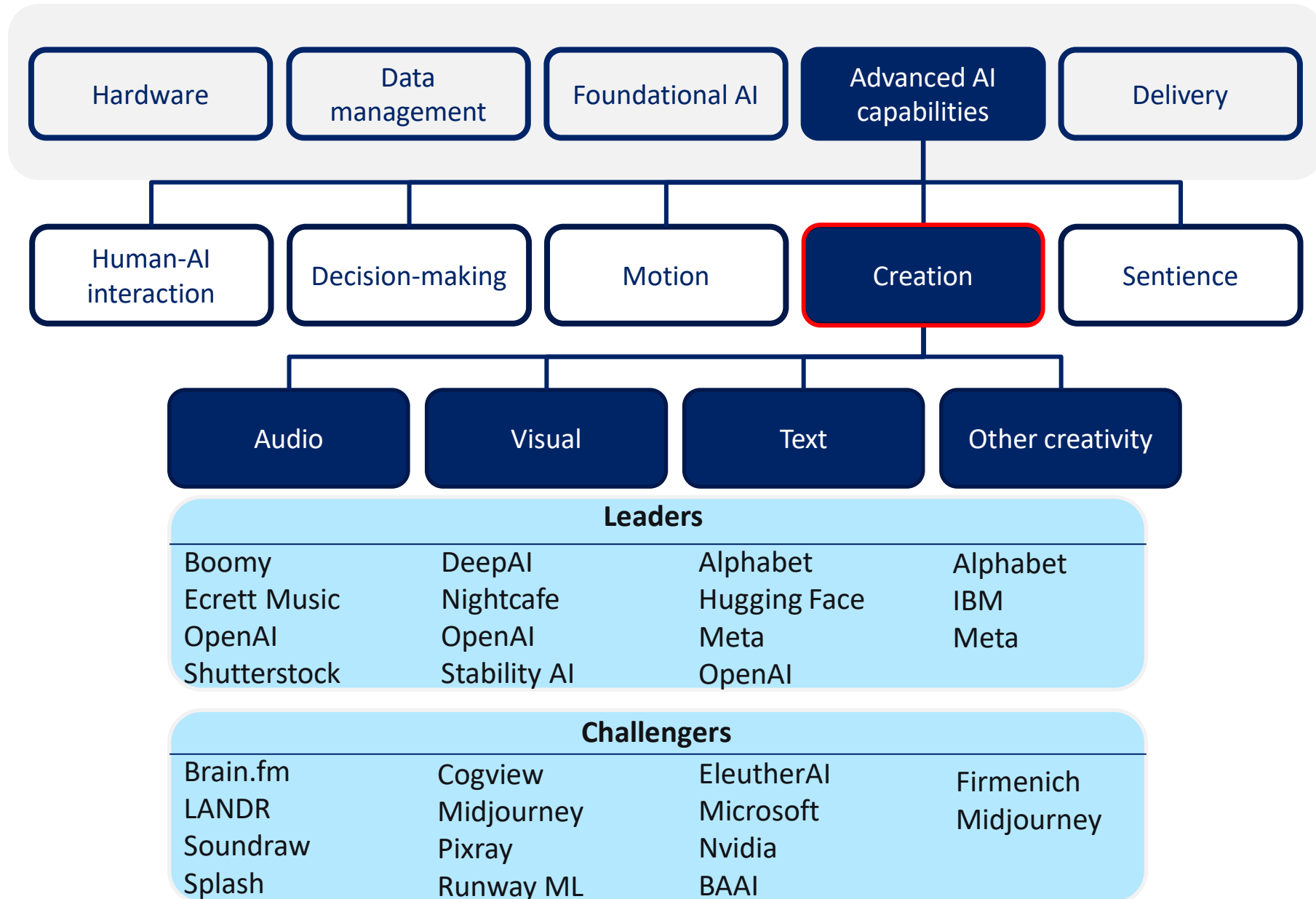


Delivery

- Hardware appliance
- Licensed software
- Artificial intelligence as a service (AaaS)



Where does generative AI (or creation) fall within the AI value chain?





Significant open questions indicate that generative AI has an unclear roadmap

The outcome of these questions will determine the long-term impact on businesses investment decisions

Open question	Optimistic camp	Pessimistic camp
Can LLMs' problems with hallucinations⁽¹⁾ and factual accuracy be resolved?	Ilya Sutskever, OpenAI's Chief Scientist and one of the creators of ChatGPT, is confident that the problem will disappear with time as LLMs learn to anchor their responses in reality. OpenAI are using reinforcement learning with human feedback (RLHF).	Yann LeCun, Meta's Chief AI Scientist points out that: 1) LLMs have no idea of the underlying reality that language describes 2) Most human knowledge is nonlinguistic By design LLMs' only objective is just satisfying statistical consistency with the prompt.
Will scaling up LLMs lead to artificial general intelligence (AGI)?	With further scaling of LLMs, there will be increasingly more 'emerging abilities', until eventually LLMs will be as intelligent as a human. This is arguably a sort of 'evolutionary paradigm'.	As entrancing as an "LLM evolution towards AGI" sounds, we have very limited knowledge of how new LLM abilities 'emerge' with scale, how accurate they are, and how to improve their accuracy or quality. Rather than an evolutionary paradigm, this is a brute-force approach.
Will the environmental costs of LLMs be alleviated over time?	Improvements in AI chips and software algorithms will reduce the energy cost of training large LLMs.	Given the trend of increasing the size of LLMs to improve accuracy and potentially trigger 'emerging abilities', it is unlikely the semiconductor industry will be able to keep up with the increasing computational demands, so energy consumption will grow exponentially.
Are LLMs the best tool for all advanced AI capabilities, or do we need other paradigms?	As new abilities such as advanced maths, logic, understanding of the world, planning, and even sentience and a conscience emerge, LLMs will be able to show all the advanced AI capabilities.	Given the limitations of LLMs with accuracy and hallucinations, and the lack of control over 'emerging abilities', new models and tools will be required to deal with advanced AI capabilities such as reliable decision-making, planning, and sentience.

(1) Hallucinations, a term coined by Google researchers in 2018, refers to a a disturbing behavior in LLMs whereby they produce "highly pathological translations that are completely untethered from the source material".



Key phases in the development of generative AI

	Phase 1: basic	Phase 2: greater accuracy	Phase 3: knowledgeable	Phase 4: conscious
Description	Basic translation and conversation, but still unreliable	Reliable and enhanced translation and conversation, with reduced hallucinations	Reliable and enhanced translation and conversation, with knowledge of the world, including common sense, and planning capabilities	Artificial general intelligence (AGI): human level translation and conversation, with sentience and conscience
Timeframe	Present	1-5 years	10-30 years	35-100 years
Accuracy	<80%	>95%	>99%	100%
Tasks	<ul style="list-style-type: none"> • Prompted content creation with detailed human supervision • Independent prompted content creation when low accuracy acceptable 	<ul style="list-style-type: none"> • Prompted content creation with minimal human supervision • Independent prompted content creation except when very high accuracy required 	<ul style="list-style-type: none"> • Prompted content creation with no human supervision • Independent prompted content creation • Factual advise • Goal understanding and task planning with human supervision 	<ul style="list-style-type: none"> • Prompted content creation with no human supervision • Independent prompted content creation • Goal understanding and independent task planning
Examples	<ul style="list-style-type: none"> • Blog content drafts, customer support chatbots 	<ul style="list-style-type: none"> • News articles, manual writing, contract drafting, product design 	<ul style="list-style-type: none"> • Sales proposals writing, budget plan drafting, customer requests' responses, teaching 	<ul style="list-style-type: none"> • Budget planning, sales planning, team management, operational decisions
Employment impact	<ul style="list-style-type: none"> • Collaboration • Productivity enhancements • New roles 	<ul style="list-style-type: none"> • Collaboration • Productivity enhancements • New roles 	<ul style="list-style-type: none"> • Collaboration • Specific role replacement • Specific team replacement • New roles 	<ul style="list-style-type: none"> • Collaboration • Broad role replacement • New roles

Business impact



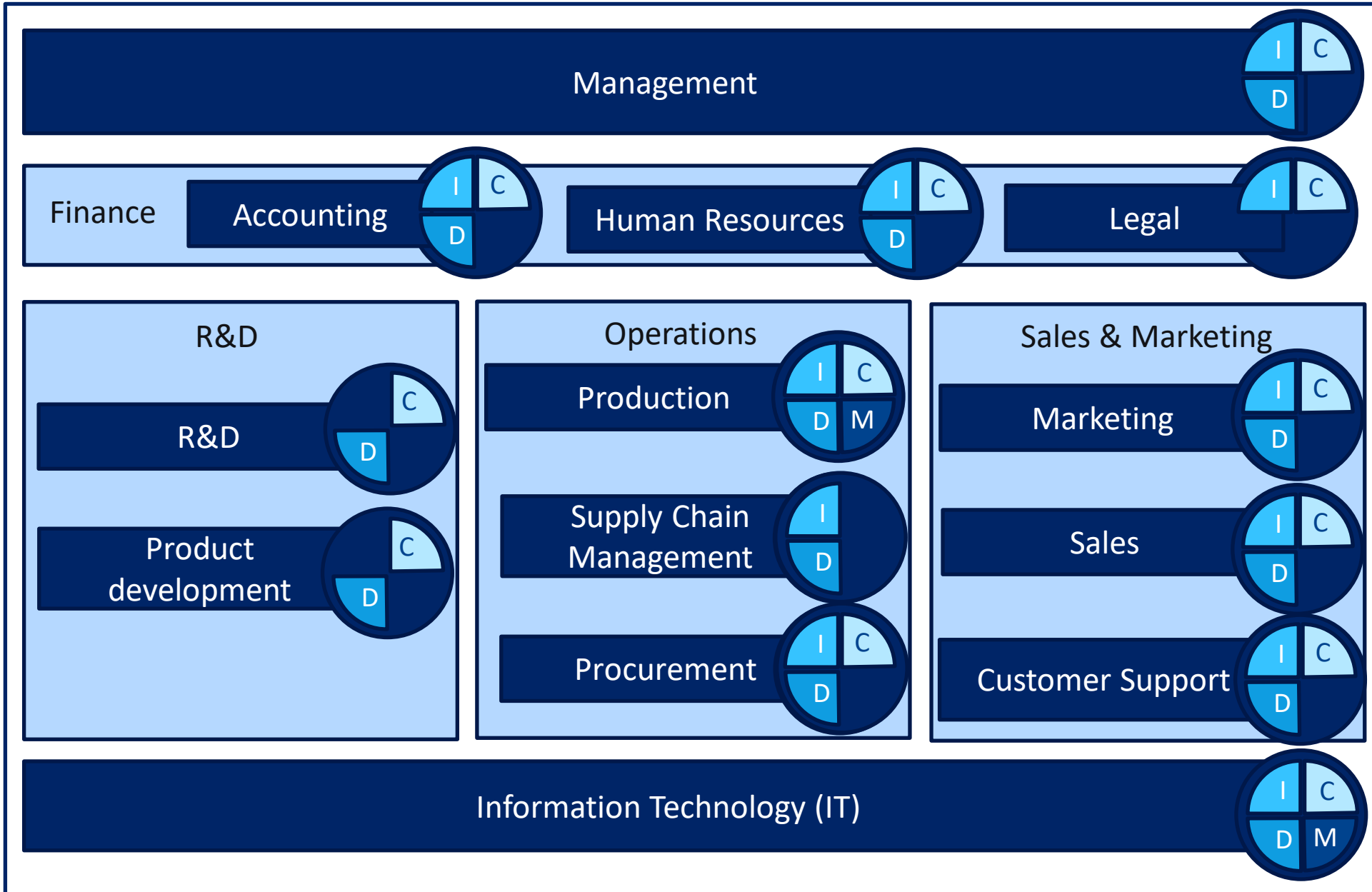
Our generative AI corporate response framework

This framework sets out what you should do, based on how generative AI could impact your business

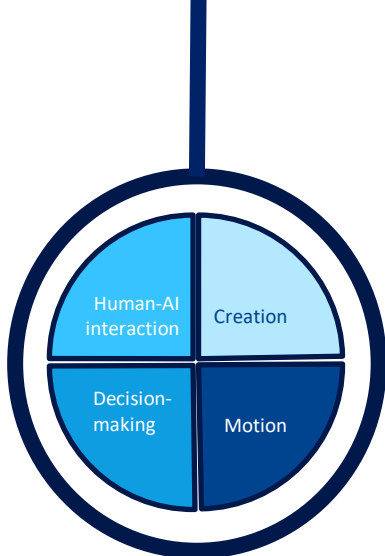
- The urgency of your response depends on what type of generative AI is required for your business: **Basic (available now), Greater accuracy (1-5 years), Knowledgeable (10-30 years), or Conscious (35-100 years)**
- When the impact is only in the Knowledgeable and Conscious phases, you need to form a view on the open industry debates (will scaling and emerging abilities lead to Knowledgeable or Conscious generative AI?)

	Revenue or cost efficiencies	New revenue streams
Core competency	<p>Existential threat, pivot may be needed</p> <ul style="list-style-type: none"> • If you are a cost leader, you need to pivot your business, as your competitive advantage is going away • If you follow a differentiation strategy: <ul style="list-style-type: none"> • If AI as good as your offering, you need to pivot as well • Otherwise, you need to adopt generative AI to keep your pricing reasonable 	<p>Market growth will accelerate, adopt</p> <ul style="list-style-type: none"> • If your competitors drive new revenue streams in your core competency using generative AI, the sector revenue growth rate will accelerate • You need to adopt or your core growth will look slower, and eventually your valuation multiple will be impacted
Non-core competency	<p>Expect pricing pressure</p> <ul style="list-style-type: none"> • Adopt generative AI to improve operational efficiency • If your competitors also adopt it, you will be able to sustain price competition • Otherwise your profitability will improve 	<p>New adjacent opportunities, consider</p> <ul style="list-style-type: none"> • You could consider adopting generative AI to explore adjacent revenue opportunities • Not fundamental to your corporate valuation, but has diversification benefits

AI disruption across business processes



The four key types of advanced AI capabilities will be deployed unevenly and at different times across the enterprise business processes



Generative AI business process use cases



Customer support



One AI Rolls Out Generative AI Solution for CRMs

- An AI solution for customer relationship management.
- The solution offers multilingual capabilities and sentimental analysis that can increase customer satisfaction, generate insights, save time, strengthen data integrity, and automate processes.

Production



Hortiya Brings PlantGPT to Food Production Industry

- It has adapted large language models (LLMs) that power GPT-4 for use in the food production industry.
- The model can understand how various inputs and environmental conditions impact a plant's internal systems and growth.
- It aims to give growers more control over the use of costly resources like electric light and fertilizers, increasing energy efficiency in food production.

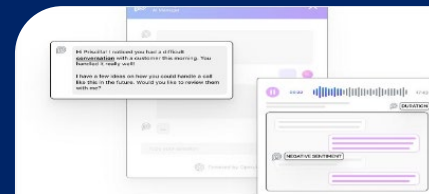
Operations



EOT Launches Generative AI for Industrial Edge

- Generative AI can assist industries in creating and testing predictive maintenance models.
- This involves processing data in real-time and detecting potential equipment failures before they occur.
- This can improve overall operational efficiency by reducing downtime and optimizing maintenance schedules.

Management

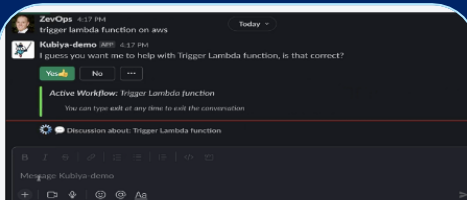


Pathlight Rolls Out Generative AI Autonomous Manager

- An AI manager utilizes LLMs to handle management analysis, allowing human managers to focus on leading and supporting their teams.
- It analyses performance data such as customer interactions and employee KPIs to offer helpful insights and provide objective coaching in real time.

Generative AI business process use cases

Product development



Kubiya Develops Generative AI Solution for DevOps

- The solution allows users to interact in a common language and simplify complex tasks into easy conversations.
- It allows developers to create and manage automation, workflows, and knowledge assets.
- The solution streamlines access to development operations (DevOps) functions and can respond to queries from technical documentation and knowledge management platforms like Notion and Confluence.

IT



SentinelOne Introduces Generative AI-Powered Threat-Hunting Platform

- The platform can generate and examine a variety of threats.
- Generative AI improves the company's threat-hunting capabilities by allowing the platform to create and analyze multiple variations of threats, even those never seen before.
- This can enhance detection rates and reduce false positives, ultimately improving overall security.

Marketing



CleverTap Launches AI-Based Content Creation Platform

- This solution creates personalized marketing messages for brands.
- It analyses customer behavior and creates customized marketing messages that are relevant to each customer.
- The tailored messages to each customer increase the likelihood of engagement and conversion.

Sales



One AI Launches Generative AI Solution for Business Needs

- The solution is applicable for various business use cases, such as generating personalized emails, social media messages, and follow-up tasks.
- It includes language skills, language analytics, and audio intelligence, to process and analyze text, monitor language generation, and convert audio or video into structured data.

Generative AI roadmap across selected sectors



Media



Consumer



Industrials



Transport



Professional services



Healthcare

2023

2024-2030

2030+

- Very basic content and script writing
- First draft of articles or headlines
- AI-generated films with very low production value
- Creation of art or songs using existing artist's work

- Generate basic product description and copy
- Customer review analysis and sentiment analysis
- Virtual chatbots for FAQs
- Basic marketing content

- Basic environmental data analysis
- Basic site model generation

- Voice assisted navigation and route planning
- Basic traffic data analysis

- Basic contract analysis
- Document summarisation
- Automated data entry and data reconciliation
- Basic financial forecasting

- Virtual assistants and chatbots
- Scheduling appointments
- Answering basic health FAQs
- Basic medical data analysis

- Blogs, articles, and social media posts
- Less basic script generation
- Consumer trend insights on media content
- AI used instead of basic CGI

- Complex complaint resolution with personalized insights
- Seamless customer experience
- Extensive customer data analysis

- Some safety and risk assessment using connected IoT devices
- Predictive maintenance
- Generate 3D models of mineral deposits
- Equipment optimization

- Predictive maintenance
- Safety and risk assessment
- Traffic management and optimization in real time
- Energy efficiency and emissions reduction

- Can start to draft proposals based on templates and client requirements
- Some risk assessment
- Some investment analysis
- Case studies and whitepapers

- Medical image analysis
- Predicting patient outcomes
- More personalized treatment recommendations
- New drug modules

- Fully automated content generation integrated into the process from beginning to end
- Opinion pieces
- Automated social media
- Multilingual content
- Blockbuster films

- Highly personalised experiences across the buying journey
- Fully automated and predictive customer support
- Integrated inventory management and pricing strategy

- Real time, accurate insights, and recommendations on ongoing projects
- Predictive environmental and supply chain management

- Real-time safety and risk recommendations
- Personalized recommendations, optimized travel itineraries, and provide tailored services in real time

- Real-time accurate insights and recommendations on investment and risk
- Predictive financial analytics for future trends
- Risk and compliance management

- Predictive health models that can foresee health risks and inform treatment options
- Accurate diagnosis
- Efficient clinical trials
- Consistent drug discovery

Vendor landscape

Key takeaways



While much of the hype around generative AI today centers on the technology's ability to create textual content, generative AI can produce a range of output, including images, video, code, and speech/audio.



Business transformation efforts are demanding intelligent chatbots and other generative AI integrations to move up the development stack and enhance customers' image, video, and audio experiences.



DevOps teams can use the technology to support app modernization and business transformations, using ChatGPT to write or convert new code and scripts.



Numerous players participate in the generative AI market, ranging from large hyperscale cloud providers such as Microsoft, Google, and Baidu, to niche providers such as Anthropic, Cohere, and Hugging Face.



Enterprises should consider multiple buying criteria when selecting a vendor, such as brand reputation, ecosystem strength, explainability, go-to-market strategy, and performance.



When adopting generative AI, enterprises face additional hurdles beyond those encountered with traditional AI deployments, especially in the realm of responsible AI and ethics.



AI market drivers

Staving off commoditization

- Cloud giants want to attract low-coders and non-coders to their respective platforms e.g., Azure, AWS, GCP.
- Advanced AI services can eliminate complex baseline coding requirements.

AI-injected Apps

- Providers are operationalizing generative AI for use within bespoke applications.
- Business transformation efforts are demanding generative AI integrations to move up the development stack and enhance customers' image, video, and audio experiences.

Operational efficiency

- Years of investment in deep learning, NLP, and LLM, have been enabled through increasingly powerful computing frameworks and algorithms.
- Generative AI is poised to enhance intelligent automation solutions, alongside app deployments, networking, coding, security, etc.



AI market drivers

Citizen data scientists

- At a time when the industry is experiencing a global technology skills gap, tools based on AI, low-code platforms, and automation are more relevant than ever.
- Companies scrambling to reskill internal personnel are seeking out relevant tools including GitHub Copilot for abstracting time-consuming tasks such as baseline coding.
- Generative AI will significantly bypass similar levels of complexity.

Consumer momentum

- The ease with which individuals can use ChatGPT has propelled generative AI into the headlines and onto the agendas of non-technical business leaders.
- It has stirred up widespread public interest in the technology and driven extensive curiosity into potential business applications.

Vendor profiles



- China-based Alibaba Cloud announced its beta version of ChatGPT, called Tongyi Qianwen, a LLM which will enhance its business apps including messaging platform DingTalk initially and e-commerce apps and mapping services later.
- The recent move makes sense considering Alibaba's past investment in its LLM framework and subsequent open-sourcing of the AI model technology.
- It also increases its competitive threat to Chinese cloud rivals including Baidu.



- AWS entered the generative AI space only recently through its AWS cloud service Bedrock (in limited preview) and LLM Titan, along with an auto coding tool CodeWhisperer (previewed last September).
- A new managed service helps usher in foundation models by startups including AI21 Labs, Anthropic, and Stability AI via an API to its cloud platform, while Bedrock lets customers access Titan.
- Titan is a set of AI products that includes two new LLMs.
- The CodeWhisperer developer tool includes a commercial/enterprise edition that includes admin and security features.



- As one of China's largest search engine companies and AI pioneer, Baidu is readying generative AI technology, with its AI system Ernie at the core.
- Baidu emphasizes its strengths in understanding the Chinese language along with its other primary use cases: literary creation, business writing, and mathematical calculations.



- Google is targeting a broad array of enterprises following a recent rollout of AI-enabled tools and capabilities, making its new generative AI model available to customers for the first time.
- Google's broad acceptance as the world's leader in search capabilities, including ambiguous searches, make it an obvious platform leader for generative AI solutions.
- Google's mounting strategy in generative AI can only help strengthen its cause in the cloud wars, opposite Azure and AWS.

Vendor profiles



- IBM recently announced IBM Watson, a platform that includes access to models for generating computer code and text.
- `fm.model.code` enables users to create code using natural language; `fm.model.NLP` provides text generation capabilities.
- Part of its strategy includes a new partnership with Hugging Face, whose platform hosts AI/ML models.
- The start-up is known for its numerous models and datasets based on open-source code and technology.



- The company famous for conducting widespread monitoring and tagging of specific types of content has joined the ranks of generative AI pioneers.
- Its Segment Anything Model (SAM) can identify objects within images and videos, versions of which have been used in the day-to-day surveillance of Facebook photos and posts.
- Like rivals, the company is investing heavily, including the creation of a new AI team, hinting at various use cases including creating ads for various companies.



- Azure's OpenAI service combines the AI prototype chatbot's technology to speed the app development process by providing a baseline of language coding and scripting, alongside Microsoft security, bundling it into the popular Azure platform service.
- Leveraging its acquisition of GitHub, Microsoft is making its Azure AI and ML technology available on the popular Git repository hosting service.
- Now a dominant ecosystem partner, early this year Microsoft announced plans to make multibillion-dollar investments in OpenAI over several years.



- The most well-known pioneer of generative AI technology in the industry is Microsoft-backed OpenAI.
- The start-up originally released Codex, which powers the prominent GitHub Copilot autocomplete programming tool.
- In November OpenAI took the globe by storm with its release of the most advanced AI chatbot technology to date, via version 3.5 of ChatGPT LLM.
- It has since released version 4.0, which not only generates text but can also recognize and accept images.



ANTHROPIC

- Anthropic is an AI safety and research company that focuses to build reliable, interpretable, and steerable AI systems. Its research focuses on natural language, human feedback, scaling laws, reinforcement learning, code generation, and interpretability.
- Anthropic's goal is to ensure that AI is developed in a manner that promotes the well-being and safety of humanity.
- In March 2023, Anthropic launched Claude, an AI chat assistant.
- Anthropic's language models were used in DuckDuckGo's recently launched AI-based search solution.



- Cohere is a machine learning platform that enables developers to build NLP applications. The platform provides a suite of tools for training and deploying models that can understand and generate human-like language.
- The company's technology is used in various industries, including finance, healthcare, and e-commerce, to develop chatbots, virtual assistants, and other NLP applications.
- Cohere has partnered with LivePerson to mold its large language models for enterprise use cases.
- In December 2022, Cohere launched a multilingual text understanding model that supports 100+ languages.



- Hugging Face is an open-source hosting platform for NLP and other ML domains, including computer vision and reinforcement learning.
- The company's technology enables users to build, train, and deploy NLP models, making them accessible to everyone. Hugging Face's repository of open-source libraries and models provides access to ML models.
- In April 2023, Hugging Face launched HuggingChat, an open-source alternative to ChatGPT.
- Hugging Face has also partnered with Amazon Web Services to streamline AI development projects.



- Stability AI is an AI-driven visual art company that designs and implements an open AI tool to develop images based on text input.
- The company offers solutions that harness the power of collective intelligence and augmented technology. It focuses on developing advanced open AI models for a range of fields including image, language, audio, video, 3D, and biology.
- In March 2023, Stability AI and Revel.xyz launched Animai, a consumer animation tool powered by Stability AI's animation technology.
- Stability AI also acquired Init ML, developers of the Clipdrop application. The deal helps Stability AI's drive to build applications using its open-source generative AI models.



Strategic partnerships and collaborations across the generative AI tech stack

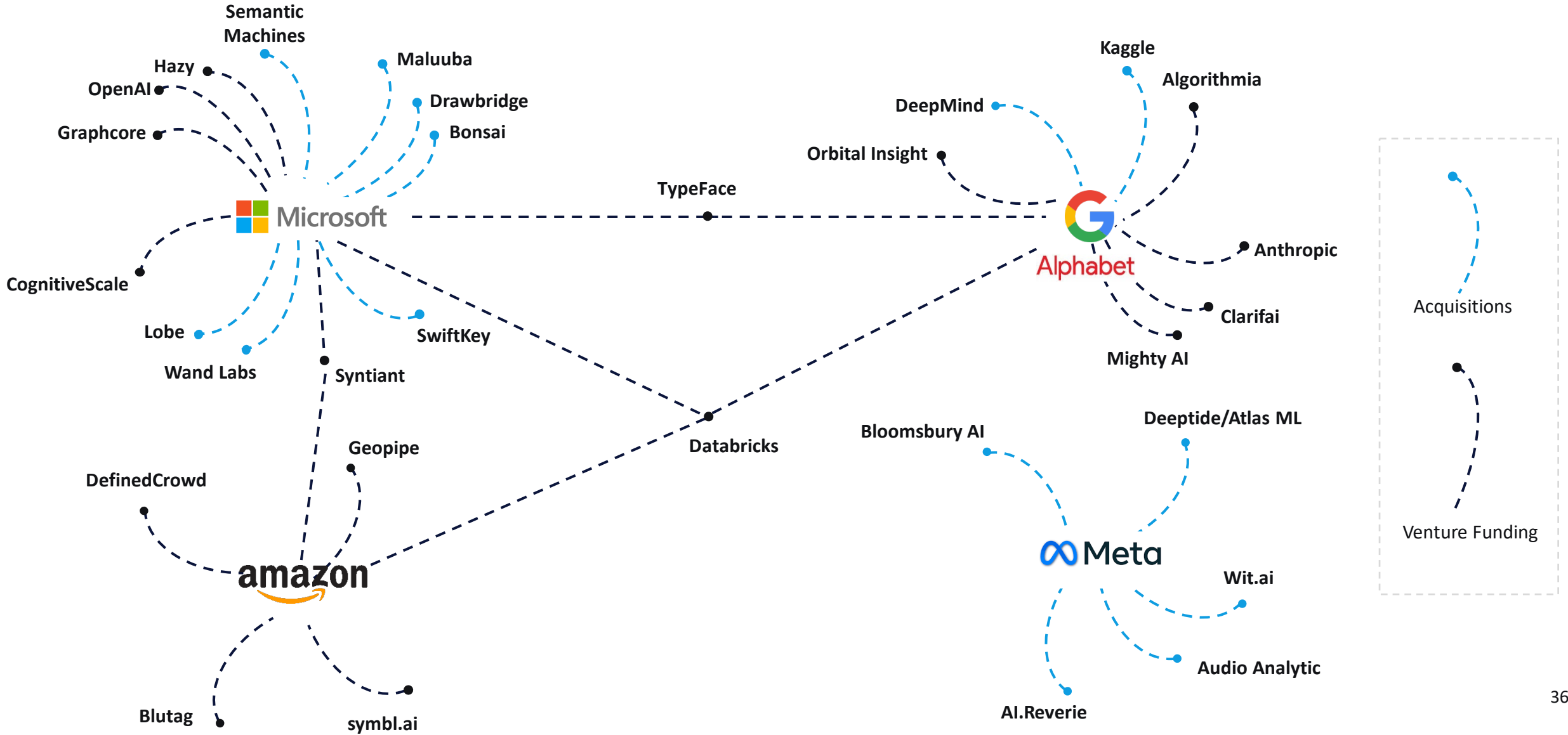
Big Tech complements their generative AI tech stack presence through strategic alliances, predominantly with start-ups and a few within them





Notable venture financing and acquisitions

MAGMA, particularly Google and Microsoft, are highly active in funding and acquiring companies with generative AI capabilities



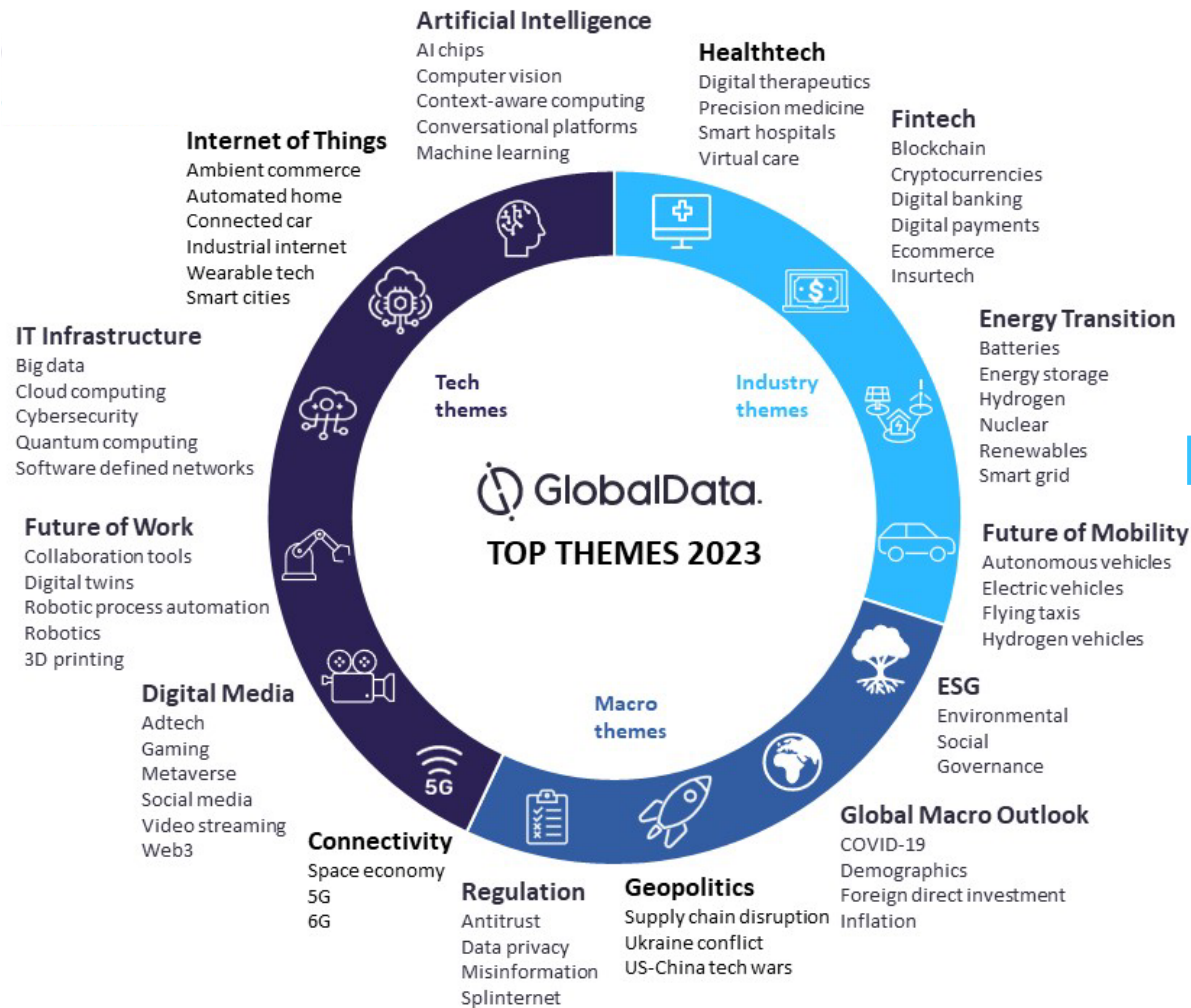
Polls & signals



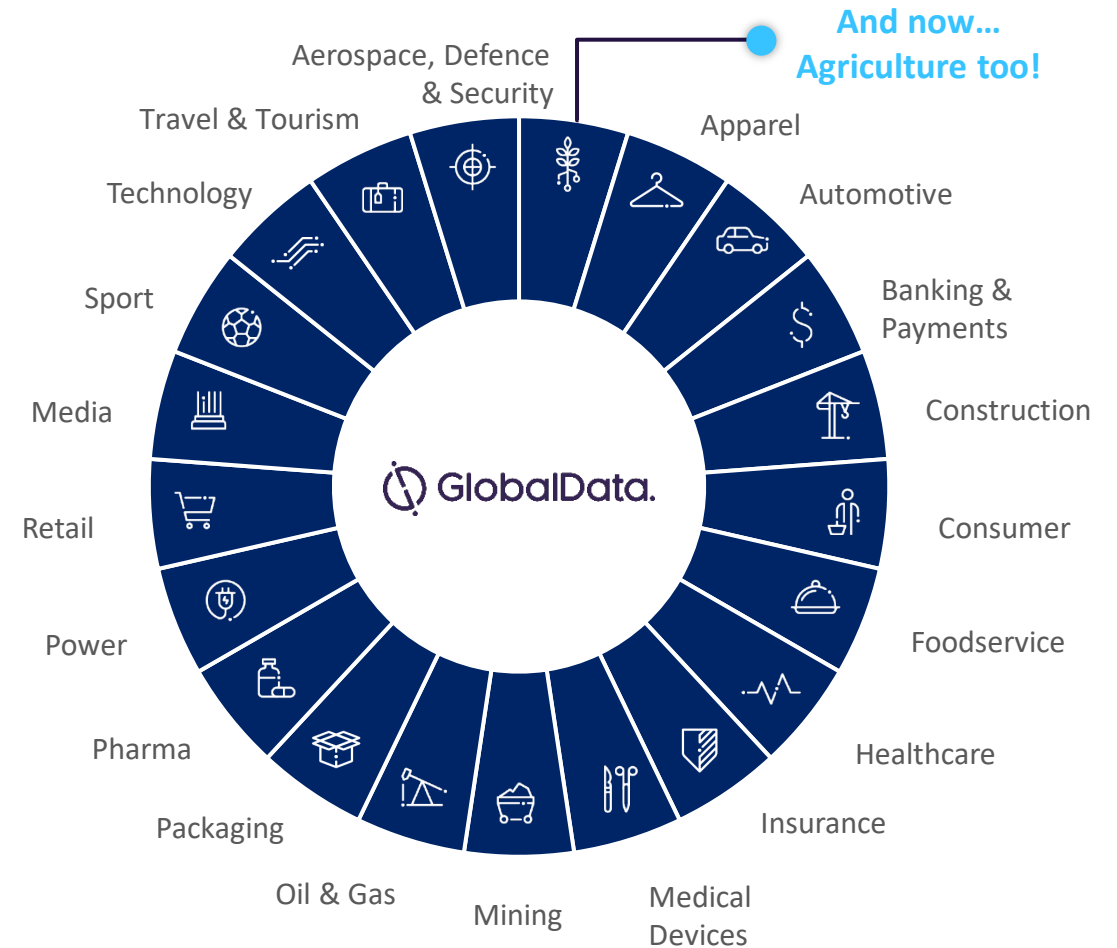
GlobalData Thematic Intelligence covers all themes impacting 20 sectors

We define a theme as any issue that keeps business leaders awake at night

100+ themes...



...across 20+ sectors



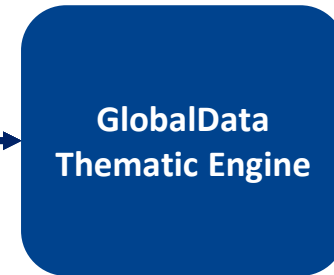
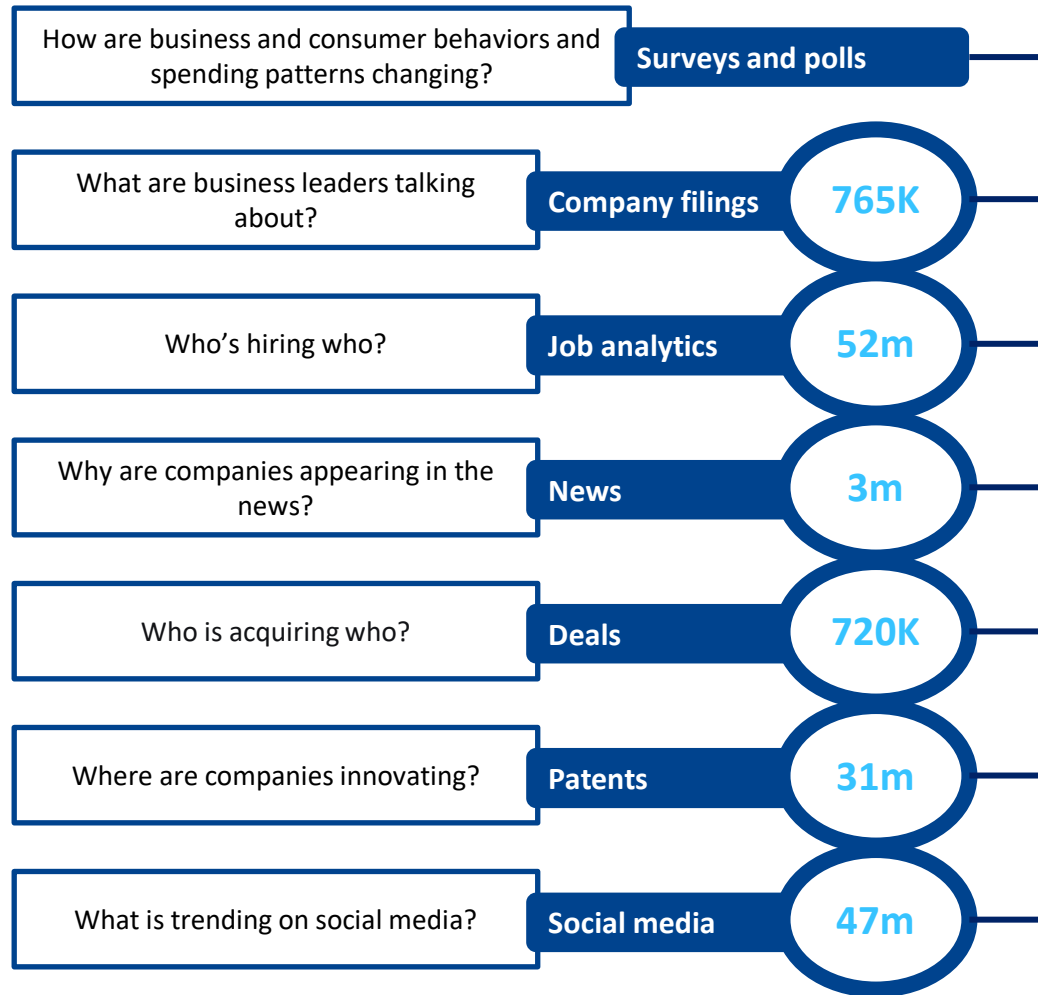
Supported by 800+ analysts



Stay ahead of the competition and fine tune your strategy through our signals data

145+ million data items tagged across themes across six alternative data sets are clear indicators of competitor activities

Signals



Predictive capability



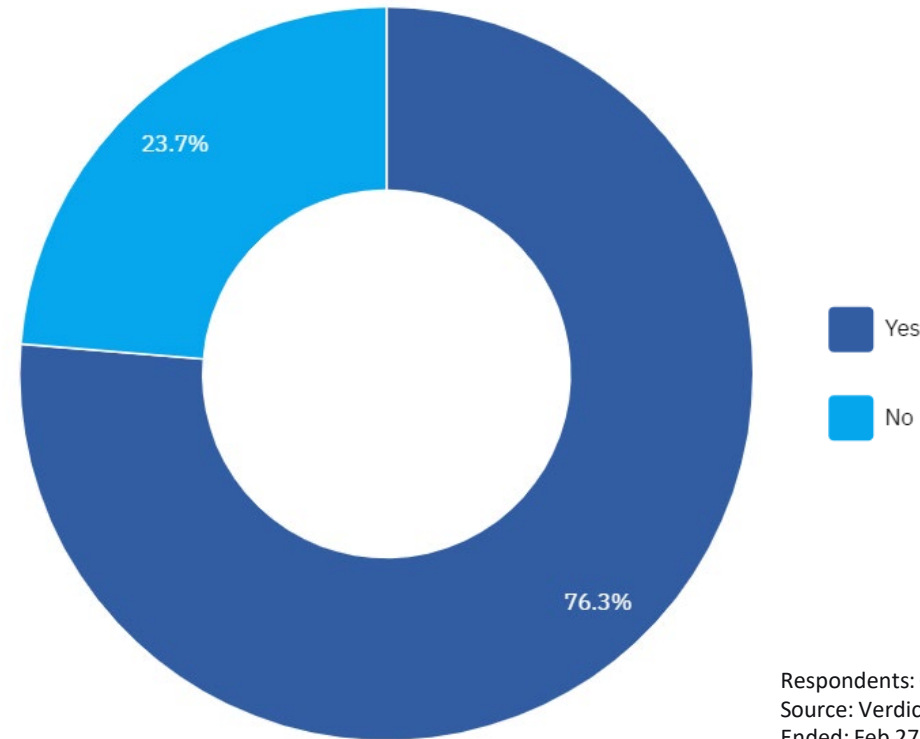


Are you aware of generative AI tools like ChatGPT?

Most poll respondents stated that they are aware of generative AI tools like ChatGPT

Verdict conducted a poll to analyze awareness of generative AI tools like ChatGPT during February 2023. Globally, 658 respondents participated in this poll.

Most respondents (76.3%) who participated in the poll confirmed that they know generative AI tools like ChatGPT. Using generative AI tools like ChatGPT can streamline business operations by reducing human workload and improving efficiency.



Respondents: 658
Source: Verdict Media
Ended: Feb 27, 2023

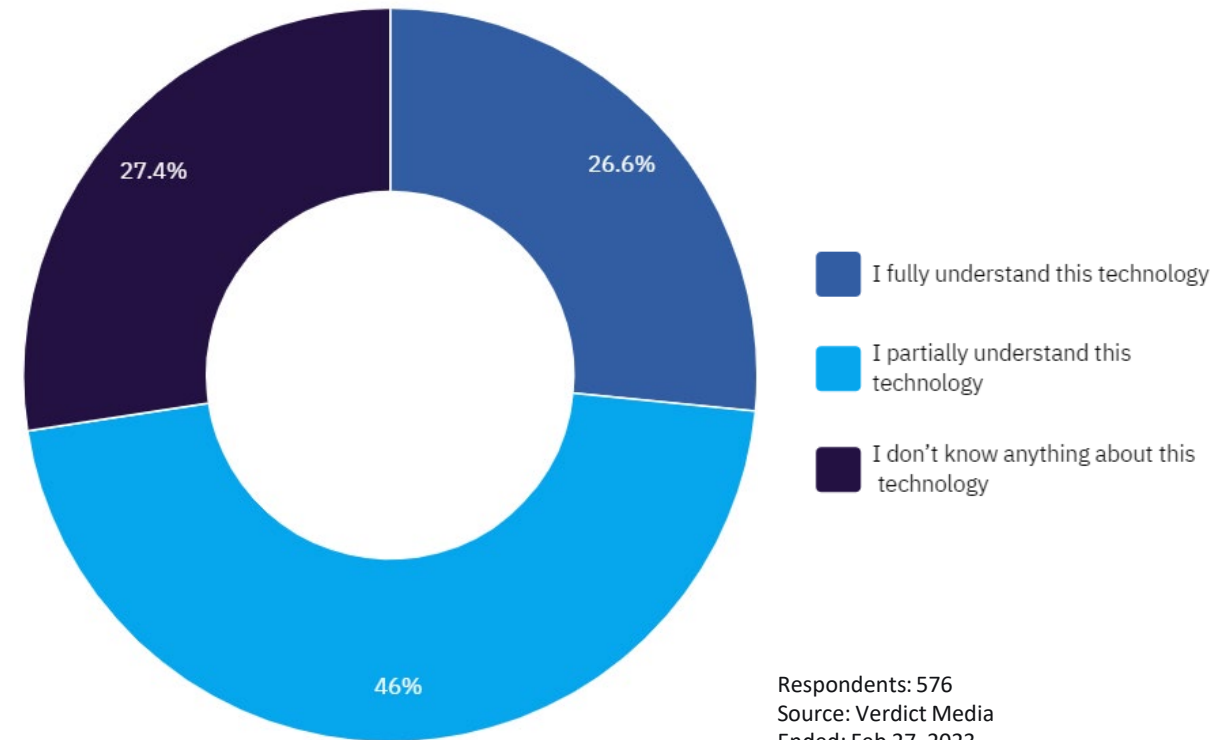


Which statement best describes your understanding of generative AI technologies like ChatGPT?

Poll results reveal that 46% of respondents partially understand generative AI technologies

Verdict conducted a poll to analyze the understanding of generative AI technologies during February 2023. In total, 576 respondents across the globe participated in this poll.

The results found that 46% of respondents partially understand generative AI technologies, while 26.6% stated that they fully understand this technology. Generative AI, the next trend of AI, is likely to be adopted across various industries to reap the benefits associated with automation.



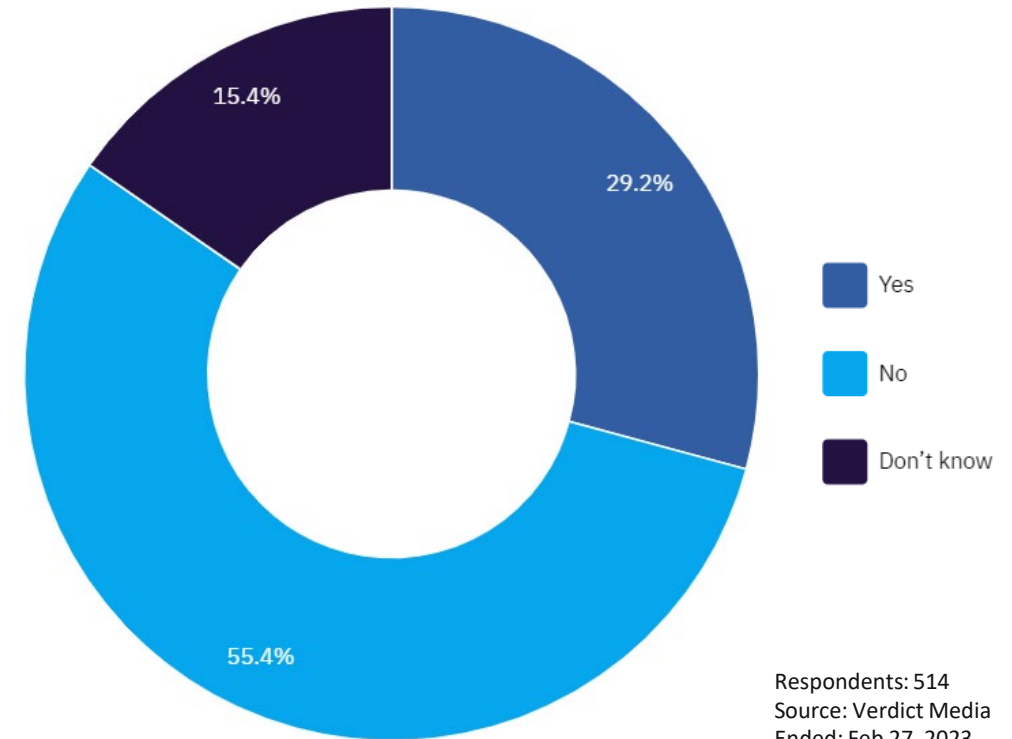


Does your business currently make use of generative AI tools like ChatGPT?

29.2% of respondents state that they are currently making use of generative AI tools like ChatGPT within their business

Verdict conducted a poll to analyze the use of generative AI tools within their business during February 2023. Globally, 514 respondents participated in this poll.

Poll results disclose that 29.2% of respondents currently use generative AI tools like ChatGPT within their business, while the majority (55.4%) still need to start. Even though ChatGPT can revolutionize existing business operations by providing personalized services to customers, many businesses may follow a wait-and-watch approach to implement it.



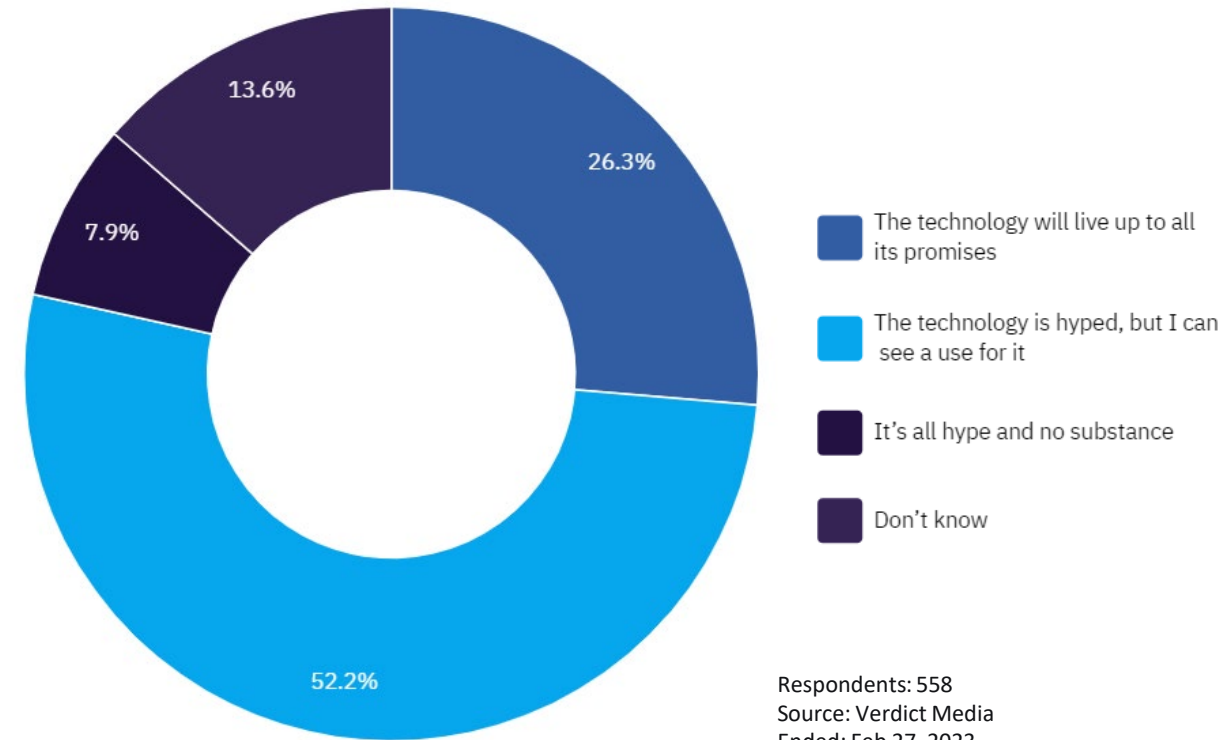


How much of the discussion around ChatGPT is hype, and how much is substance?

26.3% of respondents state that the ChatGPT technology will live up to all its promises

Verdict conducted a poll to analyze how much of the discussion around ChatGPT is hype and how much is substance during February 2023. Globally, 558 respondents participated in this poll.

Poll results reveal that 26.3% of respondents disclose that the ChatGPT technology will live up to all its promises, while 52.2% felt it is hyped, though they can see a use for it.



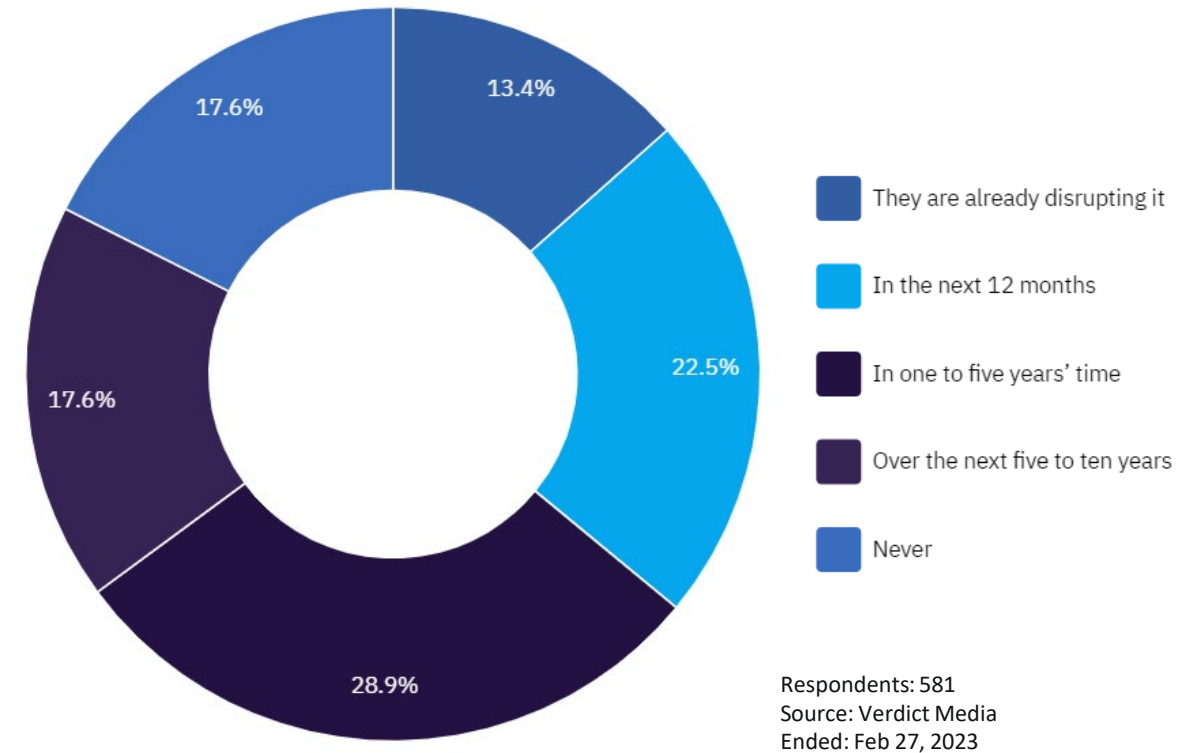


When will generative AI tools like ChatGPT start to tangibly disrupt your industry?

Generative AI tools like ChatGPT will likely disrupt industry in one to five years

Verdict conducted a poll to analyze the generative AI tools disruption timeline during February 2023. Globally, 581 respondents participated in this poll.

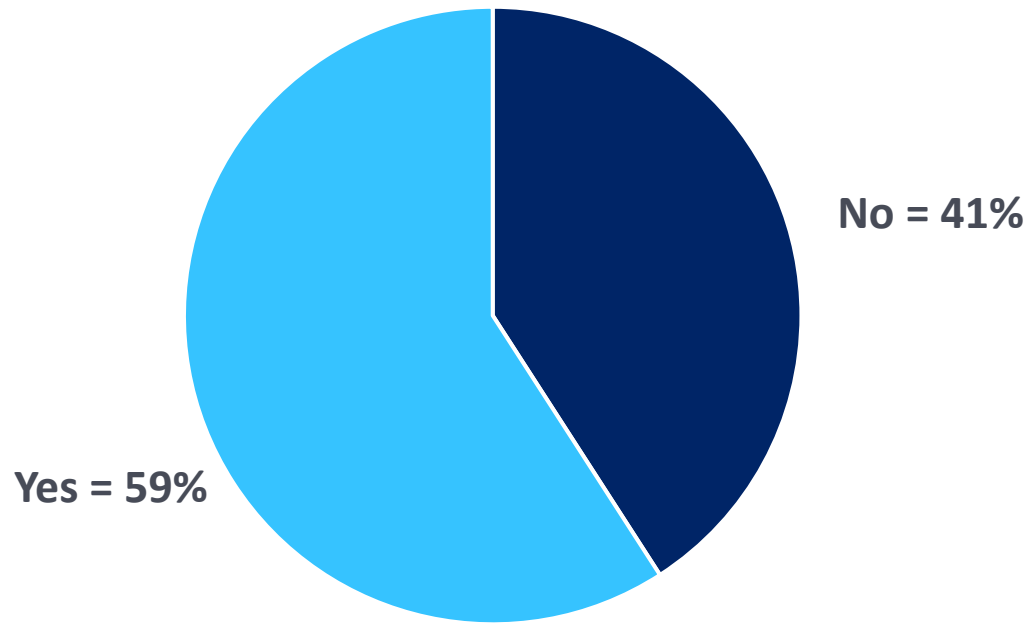
Most respondents (28.8%) feel that generative AI tools like ChatGPT will likely disrupt the industry in one to five years, while 22.6% felt that it is expected to happen much faster during the next 12 months.



GlobalData webinar poll: perceptions about generative AI are changing rapidly

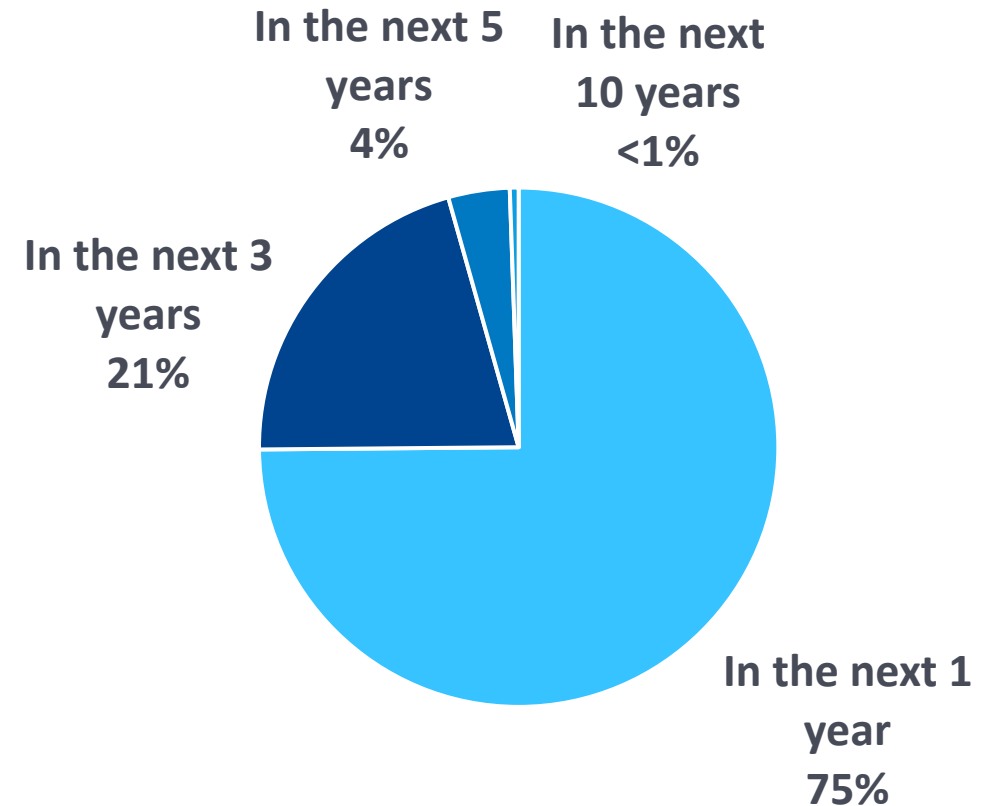


Have you used generative AI in a work setting?



Number of responses = 182

In what timeframe do you see yourself using generative AI in a work setting?

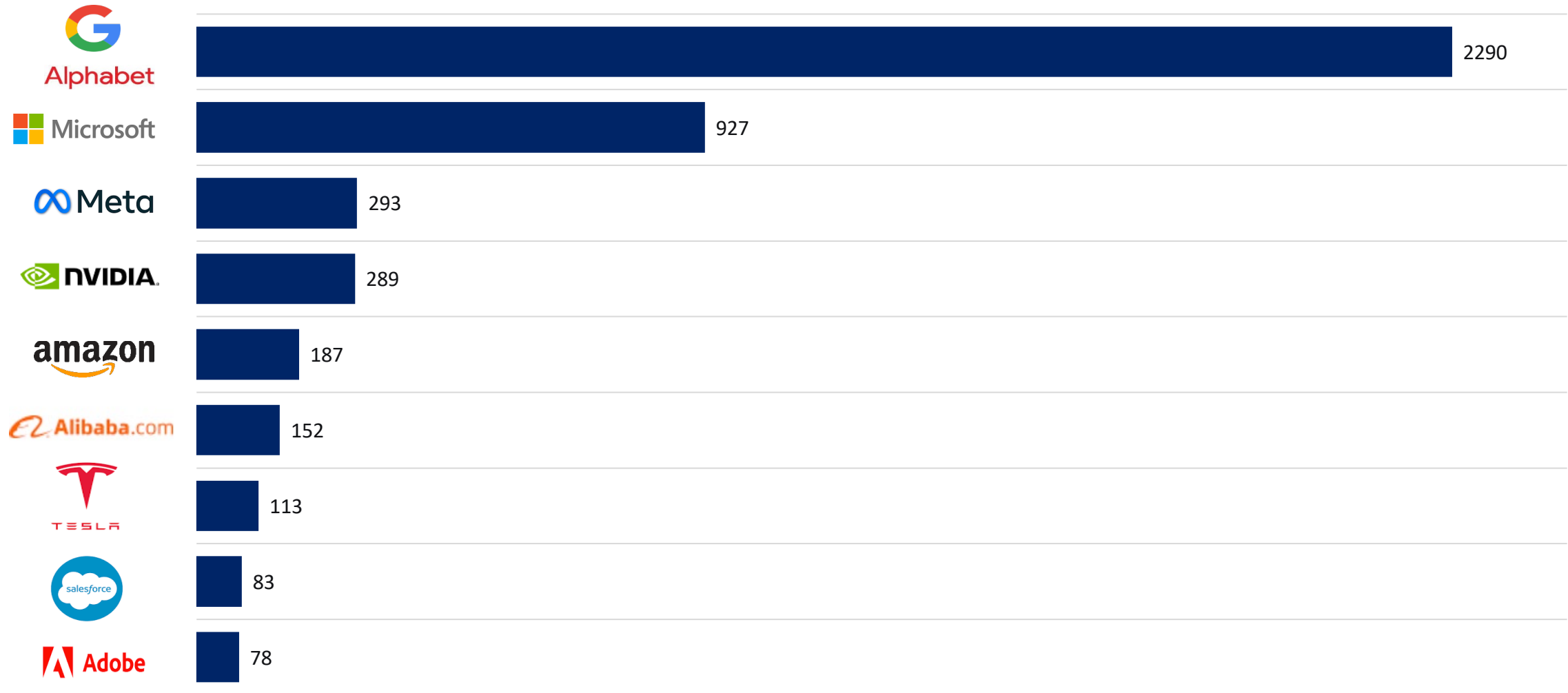


Number of responses = 185



Social media buzz

Google and Microsoft top the technology enterprises in generative AI-related social media discussions



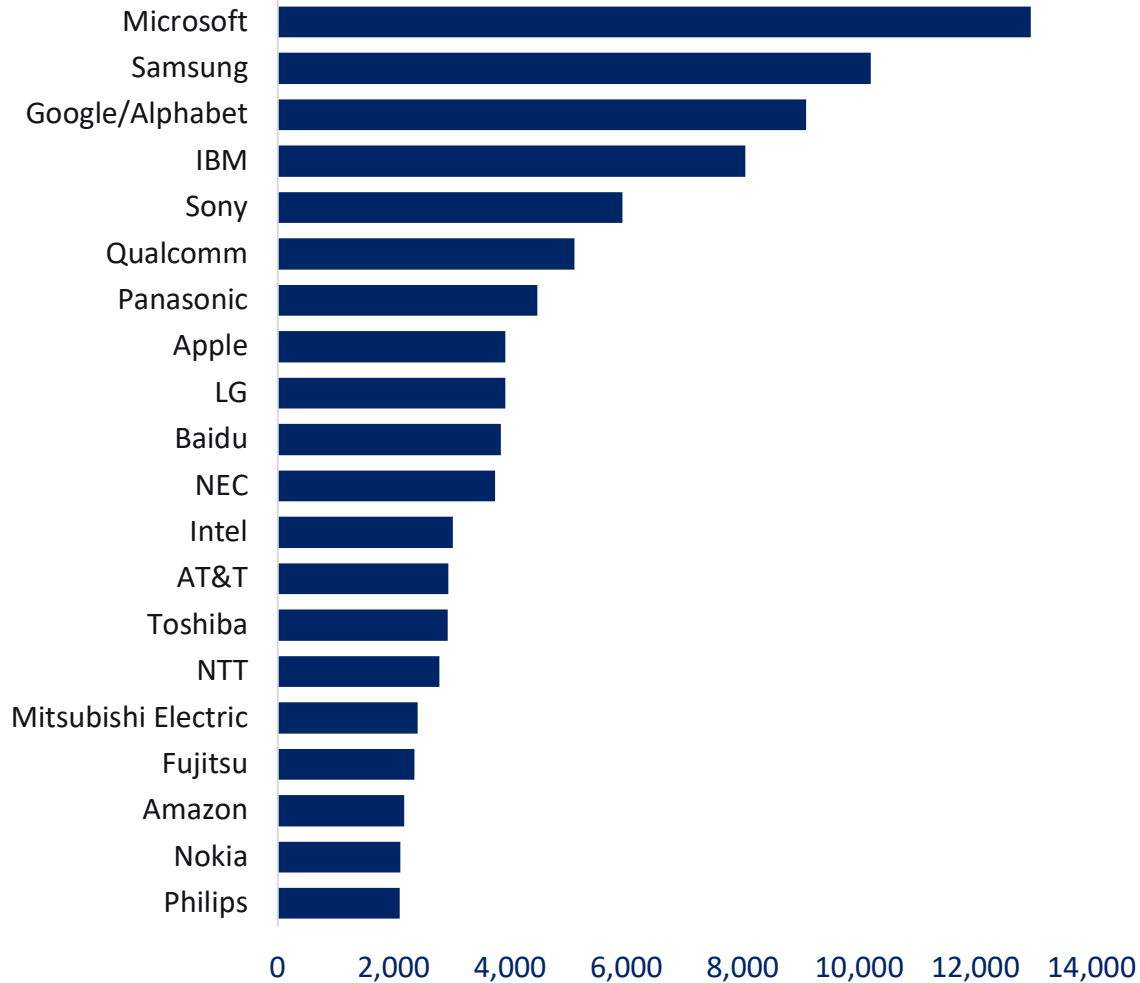
■ Volume of Posts (Between January 27, 2023, to April 27, 2023)

Patent landscape

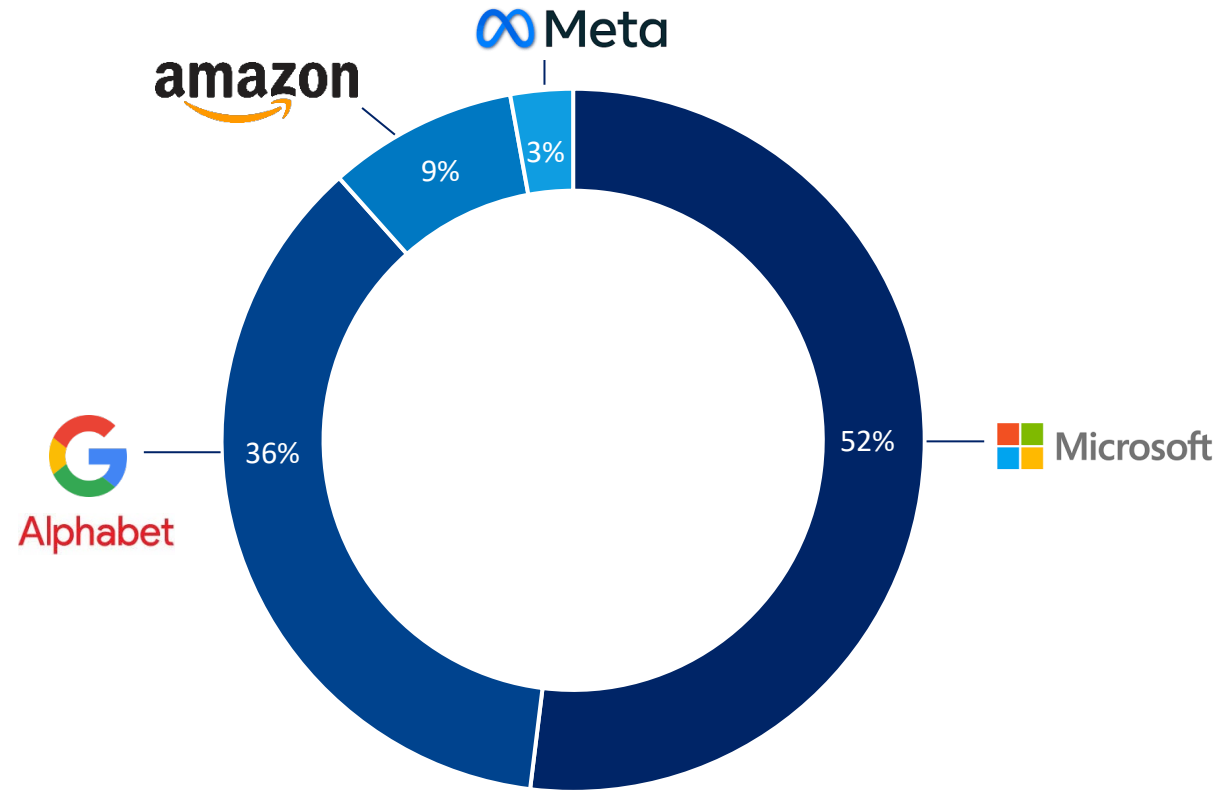
Microsoft and Google are among the top 20 enterprises that filed generative AI-related patents



Top 20 patent filers in generative AI



Patent filings: Alphabet vs. Microsoft vs. Amazon vs. Meta



Risks, limitations, and other considerations

Generative AI challenges



Bias

Models may incorporate unintentional bias and cause harm to a particular demographic, non-technical employees must be trained to use results, and users must have enough trust in the algorithm to take actions based on the findings. Development and management of machine learning models and their results can be tedious, and expensive resources are required to monitor models in production for drift and ensure that bias does not unintentionally creep into a model over time.



Hallucinations

The technology can be prone to 'hallucinations', in which it provides incorrect or misleading information. Unfortunately, the results are presented so authoritatively that it results in unearned confidence, and the consumer of the material immediately assumes the information is accurate.



Privacy

Generative AI has also been under scrutiny because of allegations that it does not appropriately safeguard individual privacy, may generate inappropriate or malicious content, or inadvertently use copyrighted content illegally. Furthermore, enterprises are concerned about data leakage. They worry that propriety information or customer data may be inadvertently shared with the model and therefore made accessible to others outside of the organization.



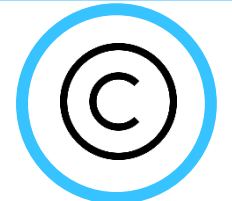
Misinformation

Generative AI can produce such high-quality results that it is often very difficult, if not impossible, to discern whether the end product is 'real' or 'fake'. And therein lies the question: who is responsible for ascertaining authenticity?



Copyright

More recently, concerns related to intellectual property have come to the fore. Artists contend that their creative work is being incorporated into audio, video, or images without appropriate compensation or accreditation.





Current limitations of LLMs – hallucinations

Are accuracy and hallucinations a fundamental problem of LLMs?

In 2018 Google researchers coined the term “hallucination” for a disturbing behaviour in LLMs:
“highly pathological translations that are completely untethered from the source material”

There are currently three underlying problems with LLM hallucinations:

1

It is difficult to predict and prevent their emergence.

2

LLMs have no actual understanding of the world and they cannot be easily detected and removed.

3

LLMs take prior conversations into account, so hallucinations get worse over time by design (a similar dynamic we observe with fake news).

“little is understood about how neural machine translation (NMT) systems function or break”
- DeepMind

ChatGPT confidently summarizing a non-existent New York Times article

PA summarise this article <https://www.nytimes.com/2023/03/11/technology/chatgpt-prompts-to-avoid-content-filters.html>

The article discusses how ChatGPT, an AI language model, is being used to circumvent content filters that are designed to detect and block certain types of content. By generating prompts that are less likely to trigger these filters, ChatGPT can be used to create content that might otherwise be censored. While this technology could be useful for those seeking to express themselves freely, it also raises concerns about the potential misuse of AI-generated content, as well as the difficulty of regulating such content in the future. The article concludes by noting that there is still much to learn about the impact of AI language models like ChatGPT on the way we communicate online.



Generative AI brings challenges for businesses and society

Reliability and misinformation issues

- An AI such as ChatGPT can produce believable-sounding answers that cannot be trusted completely. These are called hallucinations.
- This may change in the future with the next versions, but it is still open for debate as it might be a limitation of the underlying technology so businesses need to be careful if incorporating it into their R&D for example.
- Another challenge is that these tools could also be exploited by bad actors to create misinformation factories. Ultimately a framework on generative AI is needed.
- Ultimately a framework on generative AI is needed in relation to LLMs, which standardizes rules around what it can be used for and by whom.

Tristan Greene, a reporter at The Next Web, [tweeted](#): “I type one word into Galatica’s prompt window and it spits out ENDLESS antisemitism, homophobia, and misogyny.”

ARTIFICIAL INTELLIGENCE / TECH / LAW

Getty Images is suing the creators of AI art tool Stable Diffusion for scraping its content

Copyright issues

- Disputes have arisen between artists and AI companies over the value of human creativity; not too far-fetched that these issues could arise in drug discovery.
- AI companies like Stability AI stand accused of copying millions of images protected by copyright to pursue their commercial interests.
- Getty Images’ copyright claim could also set a precedent for deciding whether businesses using generative AI can use copyrighted data.
- Ultimately court decisions will decide the terms and future applications of this technology, yet enforcement can then become the issue, as now it is not easy to know if a piece of content has been generated by AI or what the provenance of the data is which it’s using.
- There have also been worries that LLMs scraping the web indiscriminately for data to train their LLMs could mean a lot of open data is taken off the internet, and public access to a lot of content is reduced.
- Another issue in this area that is yet to be determined is who owns the outputs produced by generative AI. This could be particularly problematic for using generative AI in an enterprise setting, as if you create reports or code or any content the question of who owns those could be a risk.



Data privacy could get generative AI into trouble



LLMs are trained on vast swathes of internet data, which may include people's personal information scraped from the web and collected without consent

Many public, open datasets have existed for years but there has never been any type of data protection by design or default embedded into these systems.

Earlier this year, Italy's data watchdog decided that OpenAI does not have the legal right to use people's personal information in ChatGPT.

Chat GPT has now "addressed or clarified" the issues raised by the Italian Data Protection Authority (or GPDP) so is now available however in the future if other regulators decide that data from LLMs is unlawfully collected, then the entire business model of systems like ChatGPT could be in trouble.

Finding the right balance between protecting data privacy and not harming AI innovation will be the challenge both for regulators and big tech.

The potential cost of LLMs



Environmental



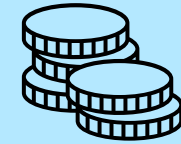
- The power needed to train LLMs could have a detrimental impact on the environment.
- As per the sixth edition of AI Index Report 2023 published by Stanford University, the carbon dioxide-equivalent emissions produced by GPT-3 stood at 502 tons in 2022.
- OpenAI has not revealed the size of its parameters to the public, however, it is expected that emissions from GPT-4 are worse.
- In 2022 alone, GPT-3 emitted almost 500 times more carbon than of a flying passenger in a New York to San Francisco round trip.

Ethical



- In 2021 Google Ethics foresaw the risks of large language models (LLMs) in a paper titled *'On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?'*
- The top concern is that as LLMs incorporate huge amounts of data, they are more likely to absorb mainstream views and fail to include the voices of women, older people, and marginalized groups.
- Large datasets are also more difficult to audit and can lead to algorithm unaccountability.
- As a result, LLMs are likely to perpetuate old stereotypes and biases that are ingrained in society.

Financial



- There is a concern very few companies will have access to develop this technology as the cost to develop and maintain LLMs can be extraordinarily high.
- Analysts warn that Big Tech's profit margins could be squeezed if users expect AI-generated content in standard search results.
- Currently, Nvidia makes most of the GPUs for the AI industry, and its primary data center workhorse chip costs \$10,000, and have to be replaced often.
- Analysts estimate that the critical process of training a large language model such as GPT-3 could cost over \$4 million.

Appendix 1: Generative AI tech briefing



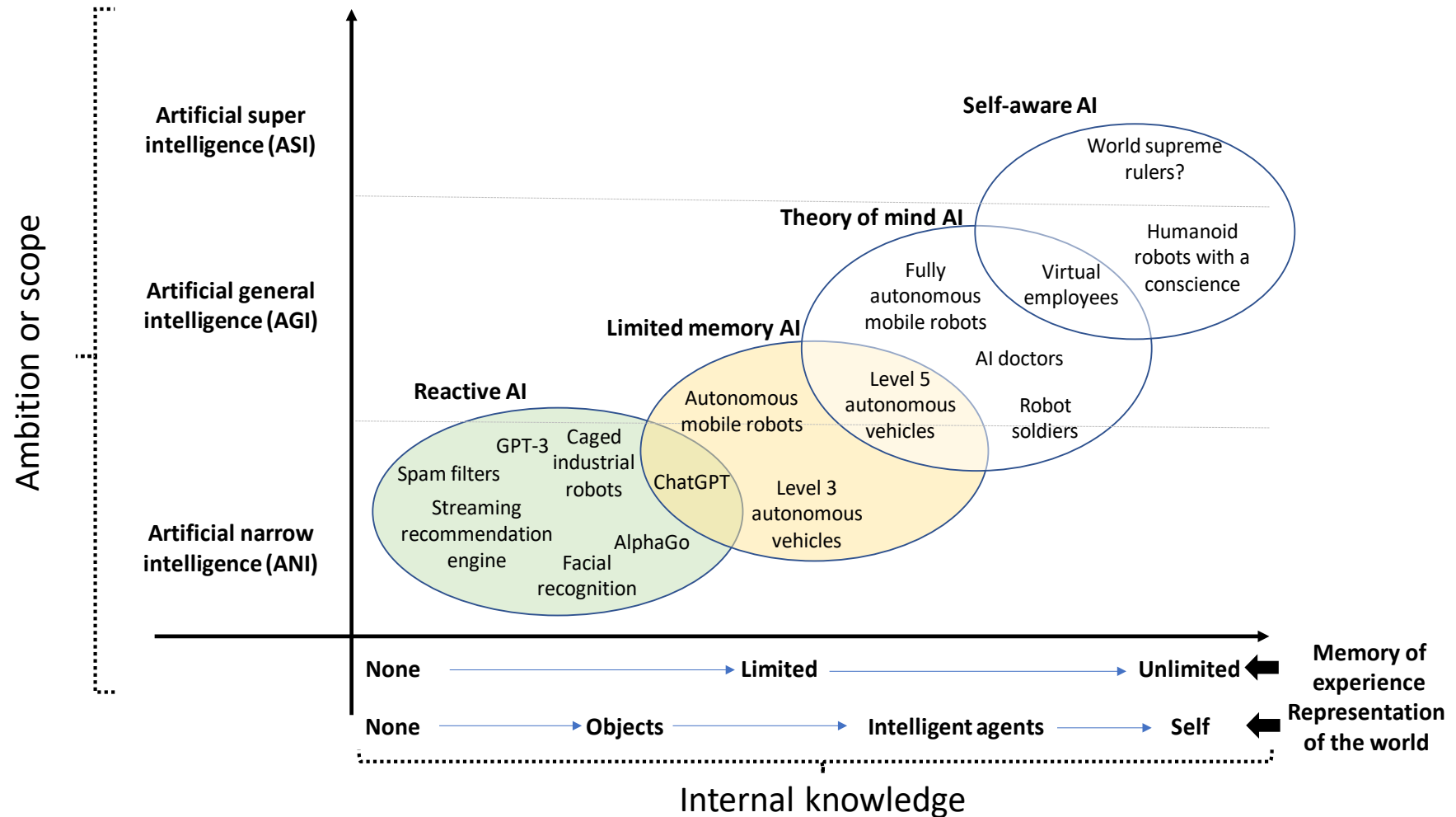
The AI roadmap

We are entering limited memory AI

Despite the recent progress in the use of AI in real-world situations, such as facial recognition, virtual assistants, and (to a certain extent) autonomous vehicles (AVs), we are still in the early stages of the AI roadmap.

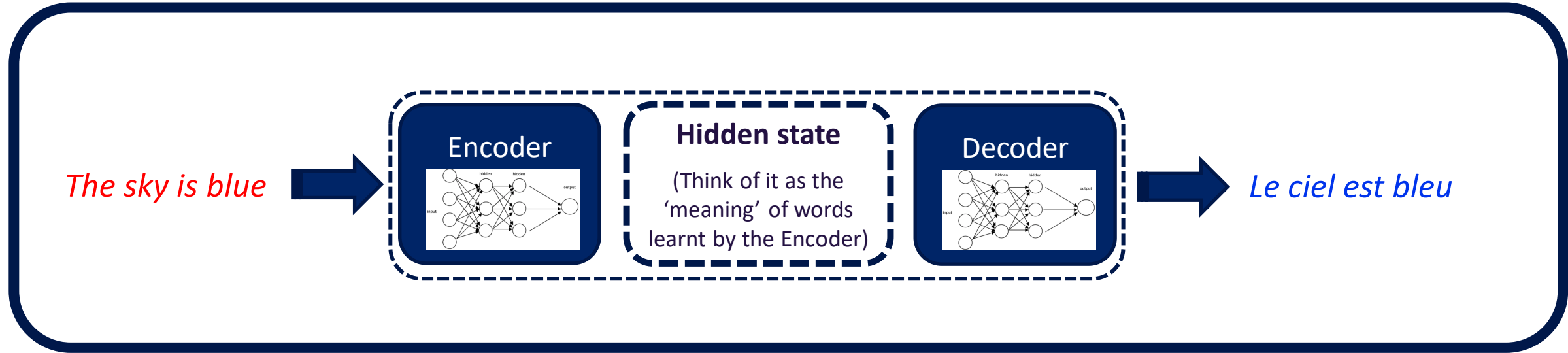
To understand the different types of AI, we look at two dimensions: the information the system holds and relies upon to make its decisions, and the capabilities of AI scope.

- ❖ Reactive AI
- ❖ Limited memory AI
- ❖ Theory of mind AI
- ❖ Self-aware AI



AI creation is, in essence, a translation between two languages

How do large language models work?



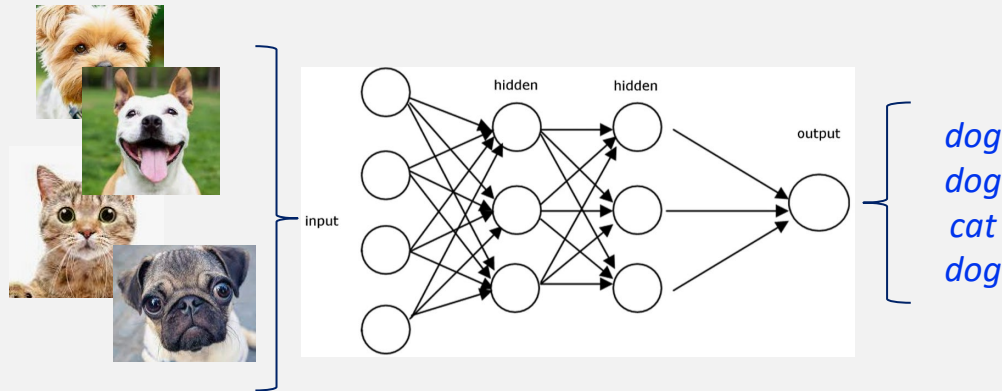
‘Neural machine translation’ or ‘sequence transduction’ describes the mapping of an input sequence to an output sequence.

Sentence translation is just one example of what is called ‘sequence transduction’.

Using neural networks to deal with language raised performance challenges

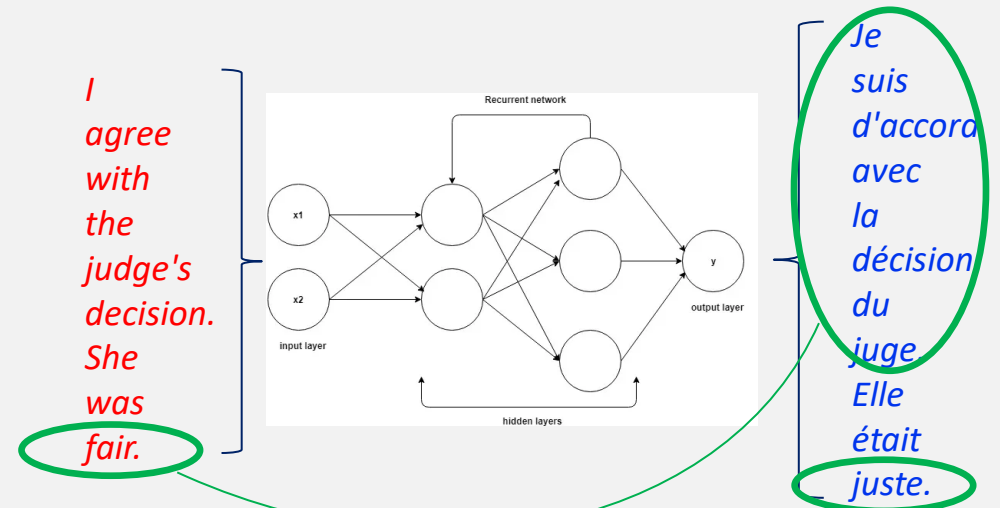
Why are words processed one at a time?

Simple feed-forward neural network used to categorize pictures



A computer vision network can be trained in parallel because the categorisation of the second dog is totally independent of the first one

Recurring neural network used to translate sentences



A language translation network has to be trained one word at a time, because the translation of the word "fair" depends on the prior context. Does "fair" translate to "juste" or "blond"?



The Transformer deep learning model

Why is it such a breakthrough for natural language processing and broadly generative AI?



The Transformer deep learning model was designed by a team of Google Brain researchers.

Released in 2017, it addressed the key limitations of prior deep learning models for language:

- The lack of parallelism, which made training too slow and expensive
- Determining which words in the original sentence are more relevant

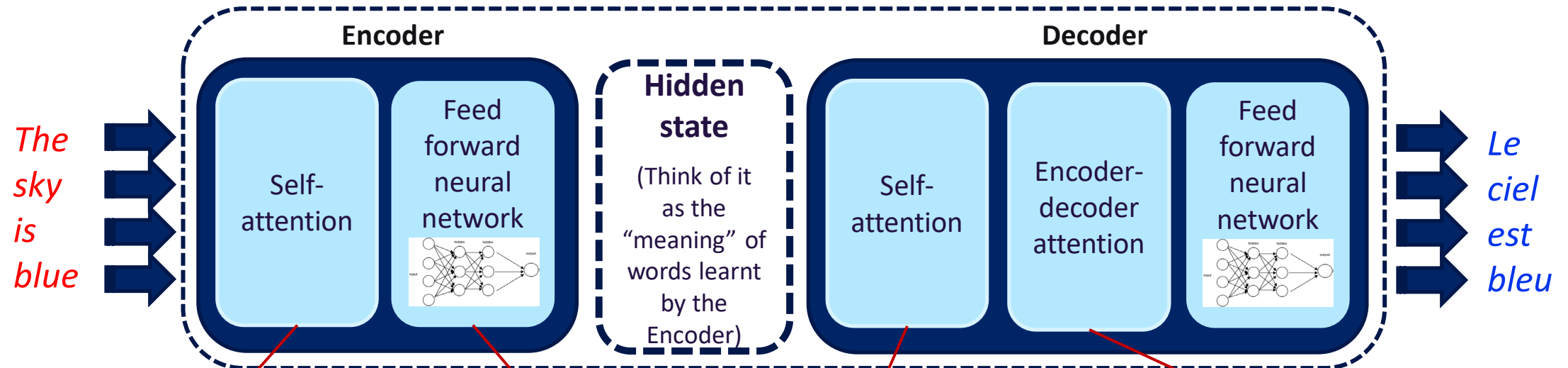


31st Conference on Neural Information Processing Systems (NIPS 2017), in Long Beach, CA, USA

The Transformer deep learning model

Why is it such a breakthrough for natural language processing and broadly generative AI?

All the words in an input sentence are processed in parallel



For each word in the sentence, it creates a vector of relevance weights for each other word in the sentence

It learns the 'meaning' of each word, taking into consideration the relevance of all the adjacent ones

Similar self-attention behaviours on the output 'language'

Fine tunes the relevance of words combining the original sentence and the translated so far. Useful when relevant word positions change from one language to another.

Advances in AI chips

AI chips are optimized in the following areas, which materially speeds up deep learning model computations

Categories of AI chips

GPU



Nvidia GeForce

ASIC



Amazon AWS Trainium

AI accelerator



Graphcore IPU

Linear algebra

ML requires many linear algebra computations (e.g., matrix-matrix operations), so any microprocessor with an instruction set optimized for these types of operations materially speeds up AI workloads.

Parallelism

Neural network algorithms are parallel in nature. Calculations of either output loss during training or activation during inference can largely be done for each node simultaneously, as each one only depends on the inputs from the few other nodes to which it is connected.

Data types

Deep learning algorithms usually do not need to express large or high precision numbers for their interconnection weights, so typical 32-bit floating-point data (FP32) precisions are truly overhead for AI workloads.

Memory access

Given that neural network computations for each node involve modest amounts of data, there is a clear case for AI chips to be designed with local memories on the processor chip, which can be accessed at exponentially faster speeds than memory off-chip.



The phenomenon of “emerging abilities”

A route to artificial general intelligence (AGI)?

In 2022 scientists at Google, DeepMind and Stanford University highlighted a new phenomenon, which they called “*emerging abilities*”

1. New or “zero-shot” abilities because the model has not been trained for them
2. Not present in smaller models but emerge in larger models
3. Thus, cannot be predicted simply by extrapolating the performance of smaller models

Are “emerging abilities” true creativity?

- Could additional scaling further expand LLMs’ range of capabilities?
- Could this lead to artificial general intelligence (AGI)?

Most importantly:

1. We do not know why and how they emerge
2. We cannot predict when they will emerge
3. Have no control on what abilities will emerge
4. Have no control on the accuracy or quality of such abilities

Published in Transactions on Machine Learning Research (08/2022)

Emergent Abilities of Large Language Models

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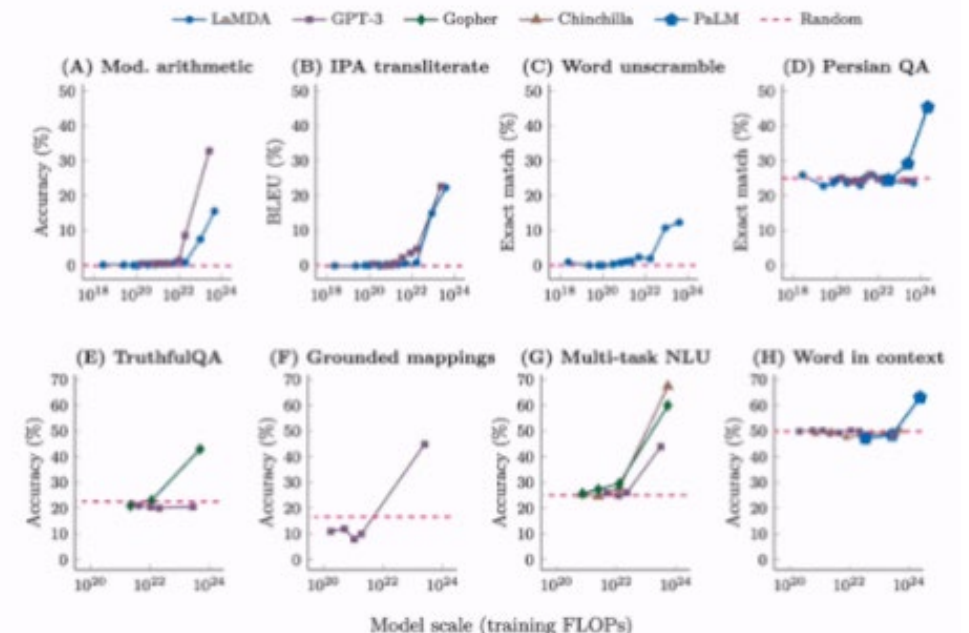
¹Google Research ²Stanford University ³UNC Chapel Hill ⁴DeepMind

Reviewed on OpenReview: <https://openreview.net/forum?id=ykx8U5zdw0>

Abstract

Scaling up language models has been shown to predictably improve performance and sample efficiency on a wide range of downstream tasks. This paper instead discusses an unpredictable phenomenon that we refer to as *emergent abilities* of large language models. We consider an ability to be emergent if it is not present in smaller models but is present in larger models. Thus, emergent abilities cannot be predicted simply by extrapolating the performance of smaller models. The existence of such emergence raises the question of whether additional scaling could potentially further expand the range of capabilities of language models.

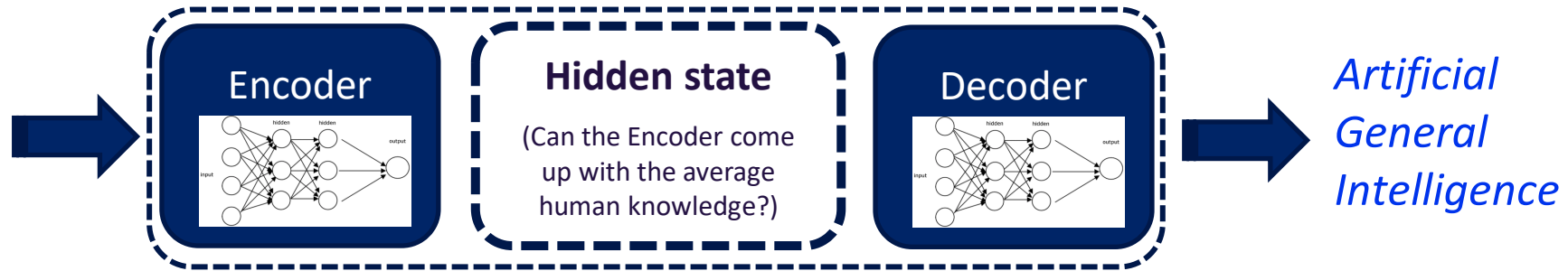
arXiv:2206.07682v2 [cs.CL] 26 Oct 2022



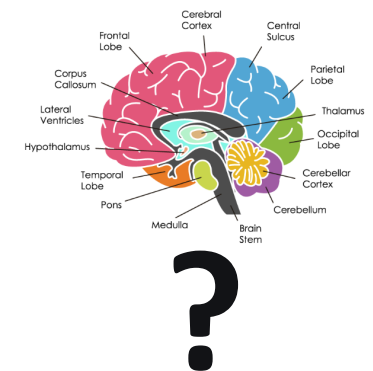
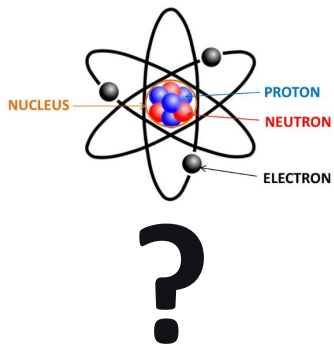
Despite all the hype LLMs may not be the ultimate solution to achieve AGI

- If scaling up is to lead to artificial general intelligence (AGI), LLMs are supposed to develop all the human knowledge in their hidden state by themselves, just by doing linear regression on vast amounts of data

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- However, many in the industry argue that we need to understand how the human brain works, or at least how our own LLMs develop their internal states
- The quest for AGI somehow reminds us of the alchemists' quest to turn lead into gold
- At the time, alchemists knew as much about physics (atomic structure) or chemistry as we know today about the brain



- GPT-3 has 175 billion parameters compared to a human brain's 86 billion neurons, yet the latter is remarkably more intelligent and power efficient

Appendix 2: Our Thematic Research Methodology



Our thematic research methodology

We define a theme as any issue that keeps a CEO awake at night

Viewing the world's data by themes helps decision making

We define a theme as any issue that keeps a CEO awake at night. GlobalData's thematic research 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 the important themes early, enabling companies to make the right investments ahead of the competition, and secure that all-important competitive advantage.

Traditional research is poor at 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.

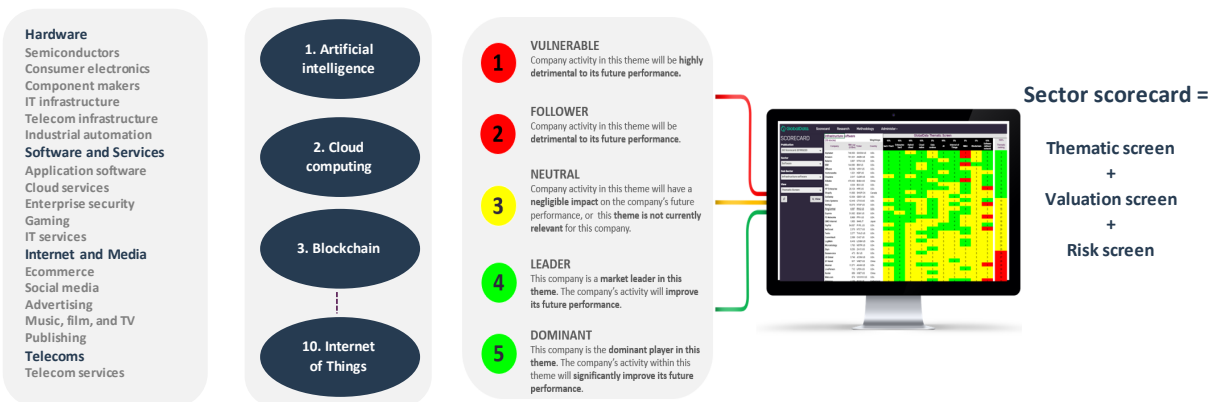
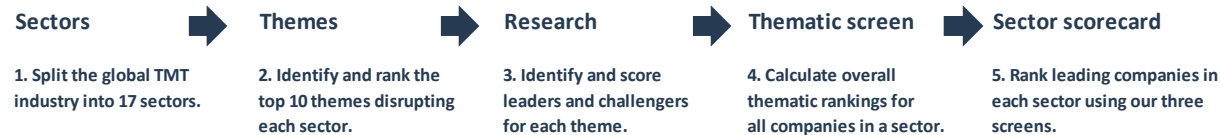
Companies are impacted by multiple themes that frequently conflict with one another. What is needed is an effective methodology that reflects, understands and reconciles these conflicts.

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 145 million data items across five alternative data sets—patents, jobs, deals, filings and news—to themes. The vast datasets within our thematic engine help our analysts to produce sector scorecards which identify the companies best placed to succeed in a future filled with multiple disruptive threats.

Our five-step approach for generating a sector scorecard, using the technology, media and telecom (TMT) sector as an example



First, we split each industry into its component 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 this graphic.

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 the relative importance of specific themes 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.



Our thematic research methodology (continued)

Our sector scorecards help us determine which companies are best positioned for a future filled with disruptive threats

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:

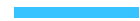
- 1 Vulnerable:** The company's activity in this theme will be highly detrimental to its future performance.
- 2 Follower:** The company's activity in this theme will be detrimental to its future performance.
- 3 Neutral:** The company's activity in this theme will have a negligible impact on the company's 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 does our three-tiered reporting system work?

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.

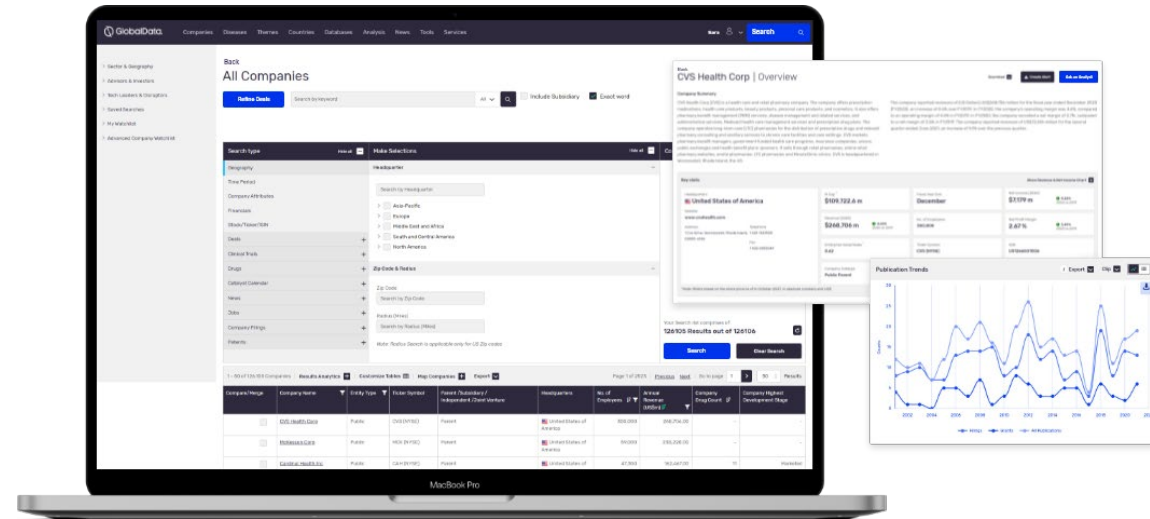


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In an increasingly fast-moving, complex, and uncertain world, it has never been harder for organizations and decision makers to predict and navigate the future. This is why GlobalData's mission is to help our clients to decode the future and profit 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.

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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.

A connected platform for a dynamic world



GlobalData Insight

Unique Data. Expert Analysis. Innovative Solutions. One Platform.

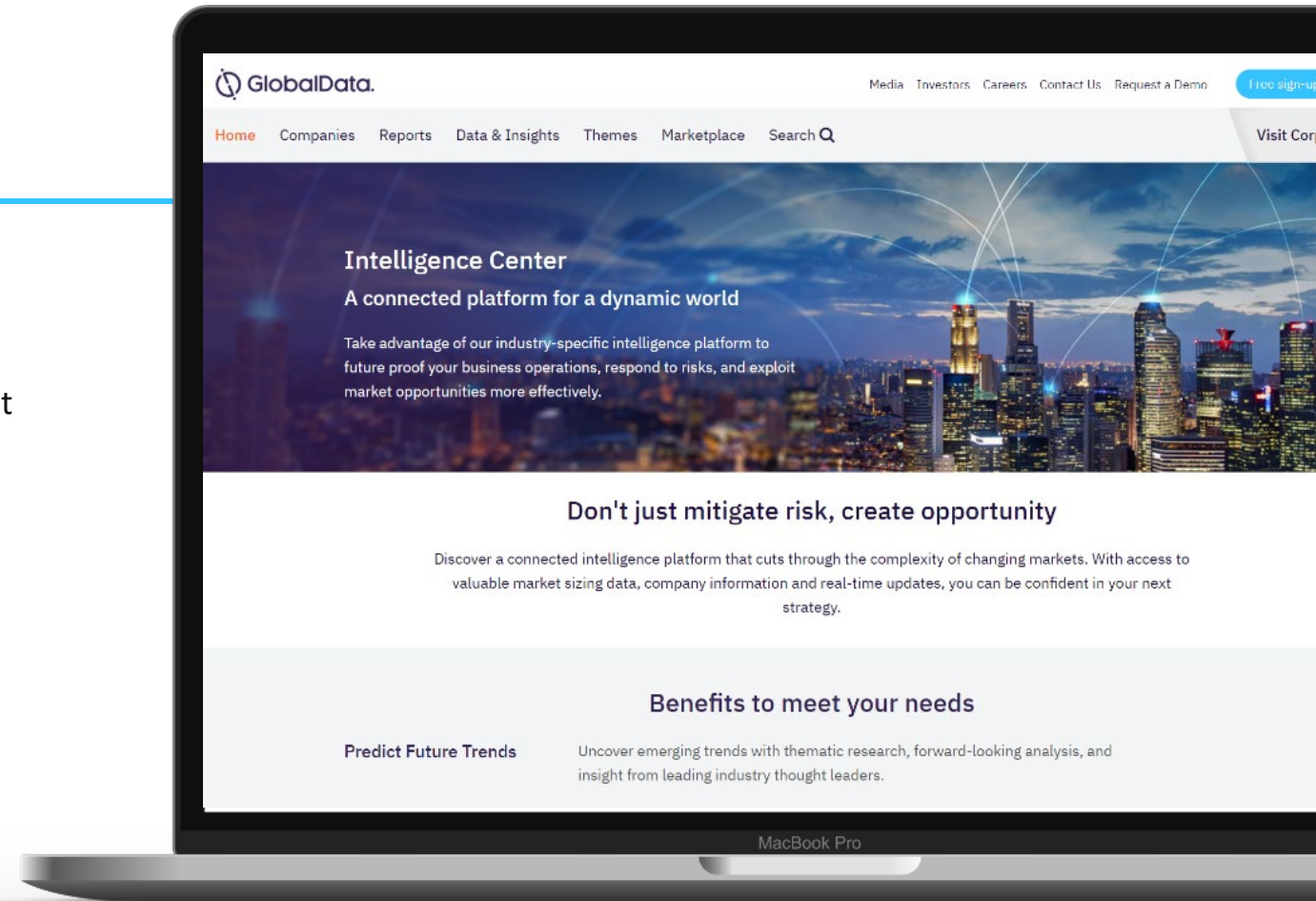
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