

AI Industry Trends

Private Investment in a New Technology Wave



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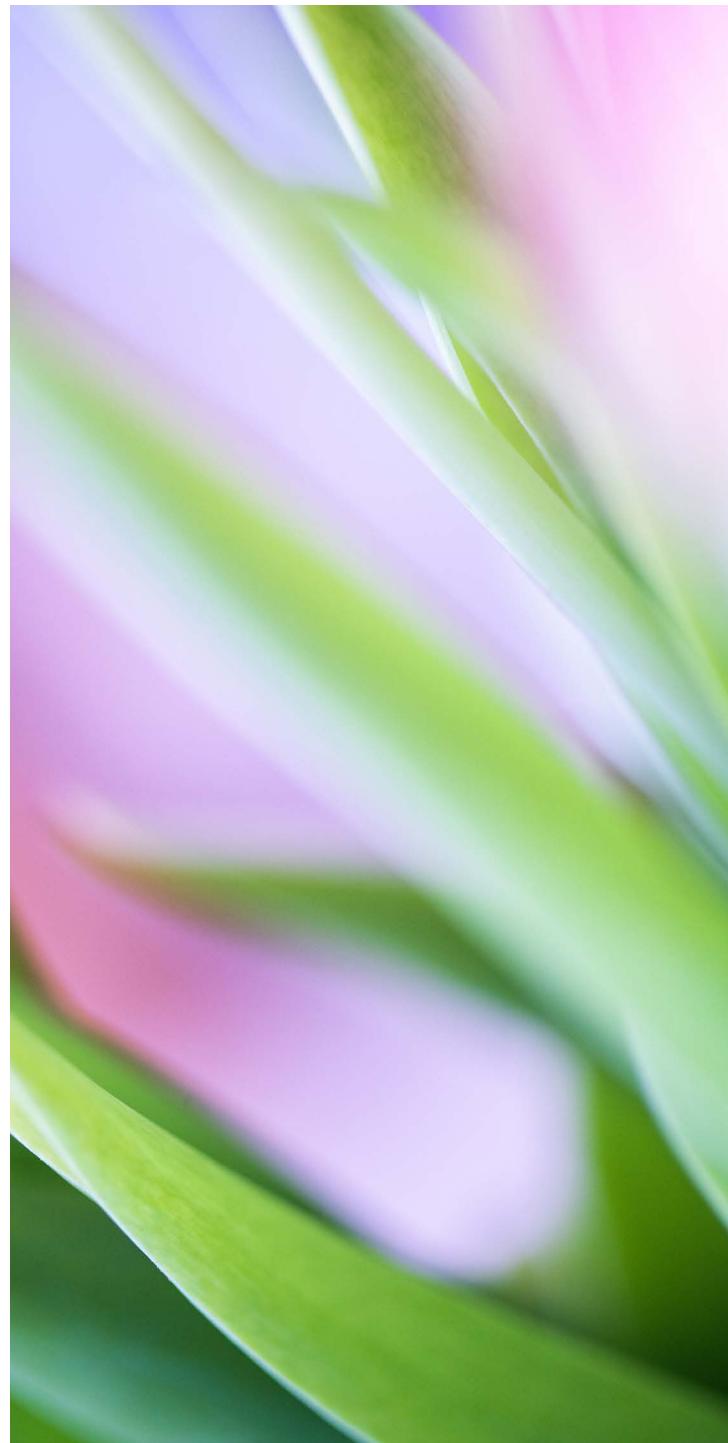
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SECTION ONE

Introduction

The skyrocketing growth in artificial intelligence (AI) applications and capability since 2019 has sparked matching interest from investors.

AI, which includes machine learning and natural language processing (NLP), is grabbing headlines in the same manner as cryptocurrencies previously, prompting concerns about risks stemming from the technology and its stability as an investment, including the impacts of potential government regulation that could limit its use, development, or accessibility.

Venture capital (VC) investment in technology hit a peak in 2021 followed by a correction in 2022. But 2023 has seen a boost in investment with AI and cybersecurity leading the way, including \$11 billion in backing from Microsoft for OpenAI. Private equity (PE) deals drove competition, notably in the health care space, where AI raises concerns about privacy even as it's expected to boost drug discovery.

Below, learn more about the AI investment landscape and what your organization needs to know about the technology and its application.

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Technology, Communications & Media, and Life Sciences Practices

Executive Summary

Private investment in the United States in artificial intelligence and machine learning (AI & ML) verticals has grown rapidly over the past decade. AI & ML applications are evolving rapidly, with the deployment of ChatGPT and DALL-E models driving increased interest in the space. Generative AI models joined the lexicon and created significant hype surrounding the technology and its ability to improve productivity.

Venture capital (VC) far outpaces private equity (PE) investment in the space and has a more consistent track record with AI & ML technology, with \$19.9 billion in VC deals closed year to date (YTD) versus \$1.8 billion in PE deals in this space. However, PE deal value in the same period already surpassed its 2022 total. PE dealmakers are waiting as technologies mature and use cases are refined.

M&A activity totaled \$8.3 billion YTD, on the heels of a record year in 2022, during which \$52.7 billion closed. Strategic transactions drove most of the total M&A value generated in 2022, but buyouts account for roughly half of total value YTD.

The IT industry unsurprisingly represents most M&A deals in the space. Notable areas of IT investment beyond pure-play AI & ML include cybersecurity, which will have increasing overlap with AI & ML as its applications expand and potential vulnerabilities are exposed. The mission-critical nature of cybersecurity capabilities can justify larger deal sizes and continued deal flow even in a slower market. The health care and business-to-business (B2B) industries are consistently represented in total deal count as well.

So-called Big Tech companies, defined in this dataset as technology companies listed on the NASDAQ 100, ramped up their AI & ML acquisitions since 2019, with a blockbuster year in 2021, during which several large acquisitions contributed to \$20.8 billion closed across 16 deals.

Microsoft's \$11.0 billion dollar bet on OpenAI isn't Big Tech's first foray into AI, but it jump-started markets' focus on its capabilities and wide range of applications. Other tech giants seeking to enter the space through acquisitions in AI include Alphabet, Apple, and Meta.

Notable risks include cybersecurity vulnerabilities, intellectual property disputes, and the need for massive computing power to run AI systems. These factors create an uncertain regulatory approach, which will require legal disputes to settle.

“While AI and other machine learning models have been growing in popularity and use over the last several years, ChatGPT popularized the use of AI among average internet users. We have just scratched the surface on what AI can do and what business models it will disrupt as the technology matures and continues to gain broader adoption.”

– Bryan Schader, Partner, Cybersecurity Risk & IT Services





SECTION THREE

Industry Trends

CURRENT STATE OF THE TECHNOLOGY

AI is inescapable in today's technology discussions. The technology is also capable of introducing itself. The following brief history was provided verbatim by ChatGPT using the prompt, "Explain the history of AI in 75 words or fewer."

AI emerged in the 1950s when John McCarthy coined the term. Early efforts aimed to replicate human intelligence, but progress was limited. In the 2010s, breakthroughs in deep learning and neural networks reinvigorated AI, leading to significant advancements in areas like computer vision and natural language processing. Today, AI is transforming industries with applications in autonomous vehicles, smart assistants, and more.

The NLP showcased above is one highlight of recent AI development. NLP falls under the umbrella of generative AI, which refers to models that generate forms of media in response to prompts by recognizing patterns in its input data.

Other areas of recent AI development include synthetic data, which is used in large quantities as input to train generative models, and accelerated computing, or the use of specialized hardware to speed up processing and offload tedious computing tasks.

Demand for computing power to support generative AI models is expected to grow exponentially as their use rises.

The presence of chatbots and aspirational AI integrations has swelled, and markets look to filter out the noise and identify the strongest applications. There will inevitably be winners and losers in the race to integrate AI.

Both consumer and enterprise applications for these technologies took off with exponentially greater attention paid by public and private markets. VCs led early private investment with a greater appetite for speculative and frontier technologies, but as AI companies mature and use cases expand, PE firms and M&A dealmakers are taking notice.

The recent wave of interest in AI has drawn comparisons to the levels of investment and excitement that surrounded cryptocurrency—the total market

capitalization of which peaked in 2021 and since dropped precipitously in what many refer to as a crypto winter.

Some investors are still recovering from this descent as crypto platforms remain embroiled in legal proceedings, and they might take a more tempered approach to this next wave of technology. Despite this hesitation, markets more broadly are eager to invest in AI, and this is providing cash windfalls for AI-related ventures.

Several risks emerged in tandem with the growing interest in the space.

Cybersecurity remains a priority—particularly regarding chatbots' ability to replicate information in a way that can be exploited by bad actors for purposes including identity theft.

Generative models may also present inaccurate information, or hallucinate, in convincing fashion, which creates a need for human review and fact-checking of the technology.

Government response has varied, as with Italy's outright ban on ChatGPT

which it later reversed, and the EU's proposed restrictions like the European AI

Act. Dealmaking will require detailed due diligence for compliance, especially as regulatory restrictions evolve. Expect extended timelines for deal closures dealing with more sensitive areas like biometric identification.

There are also intellectual property concerns. Generative models use large quantities of data as inputs to mimic projects and create new content, thus raising the question of copyright infringement regarding both training data inputs and generated outputs.

One concern raised in the Writers Guild of America (WGA) strike is the regulation of AI usage in scriptwriting and source material. Ongoing disputes have yet to set precedents for intellectual property law in relation to AI models, meaning legal risks remain for investors.

VENTURE CAPITAL INVESTMENT: EARLY INVESTMENT DRIVES CONTINUED MOMENTUM

FIGURE 1: US AI & ML VC Deal Activity



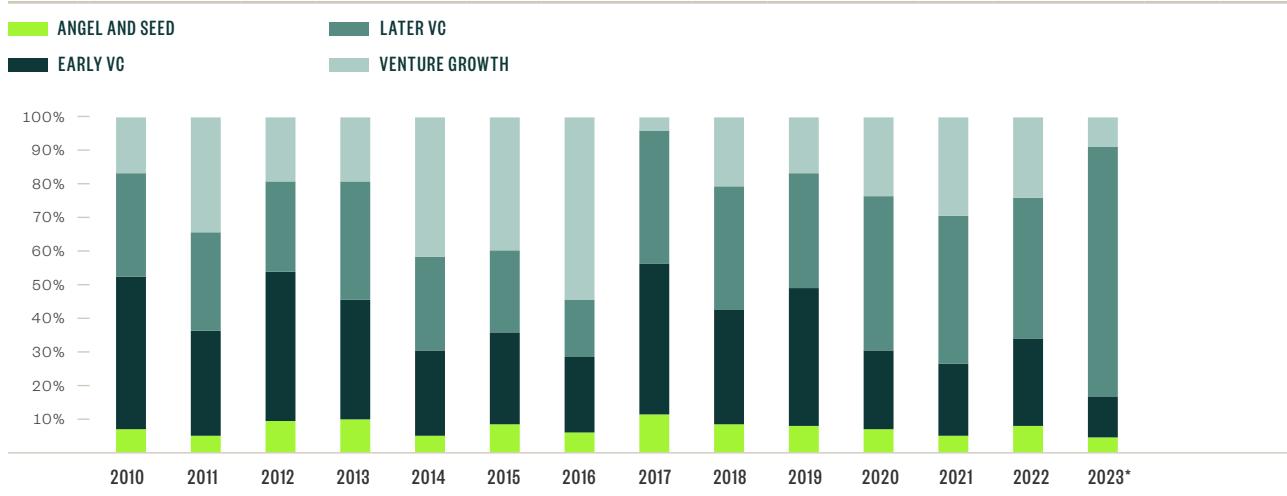
*As of 05/24/2023

FIGURE 2: Share of US AI & ML VC Deal Count by Size Bucket



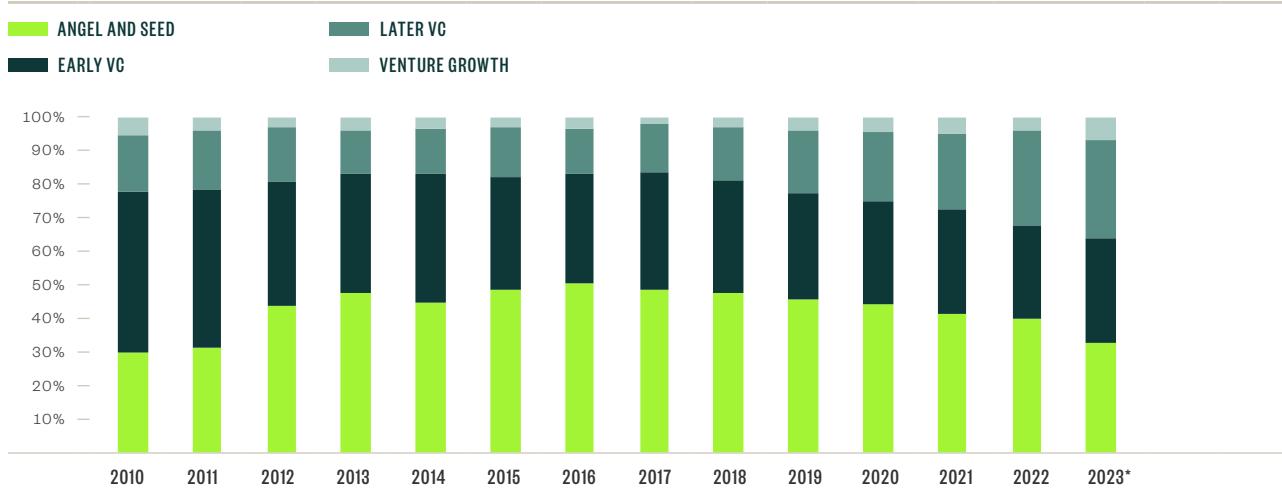
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FIGURE 3: Share of US AI & ML VC Deal Value by Type



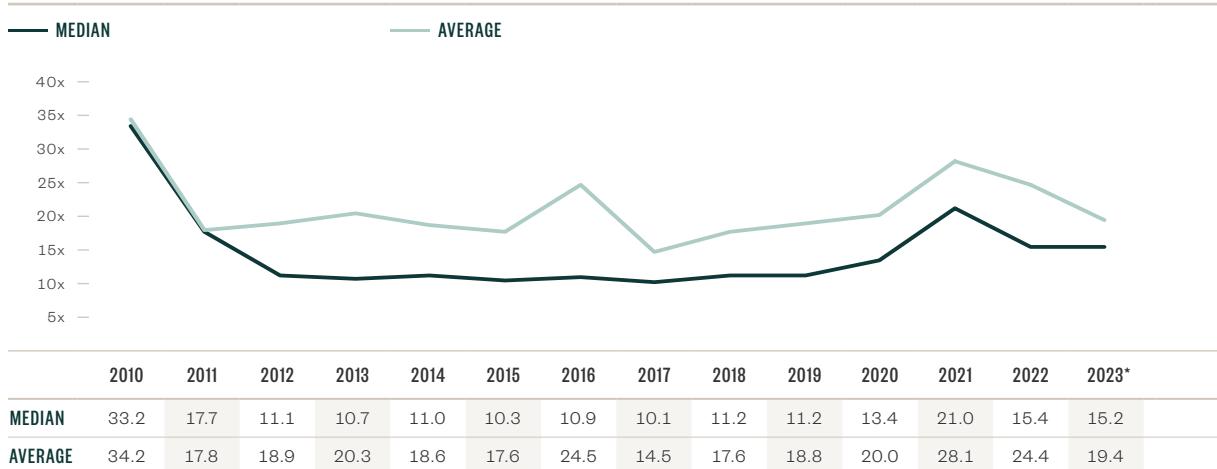
*As of 05/24/2023

FIGURE 4: Share of US AI & ML VC Deal Count by Type



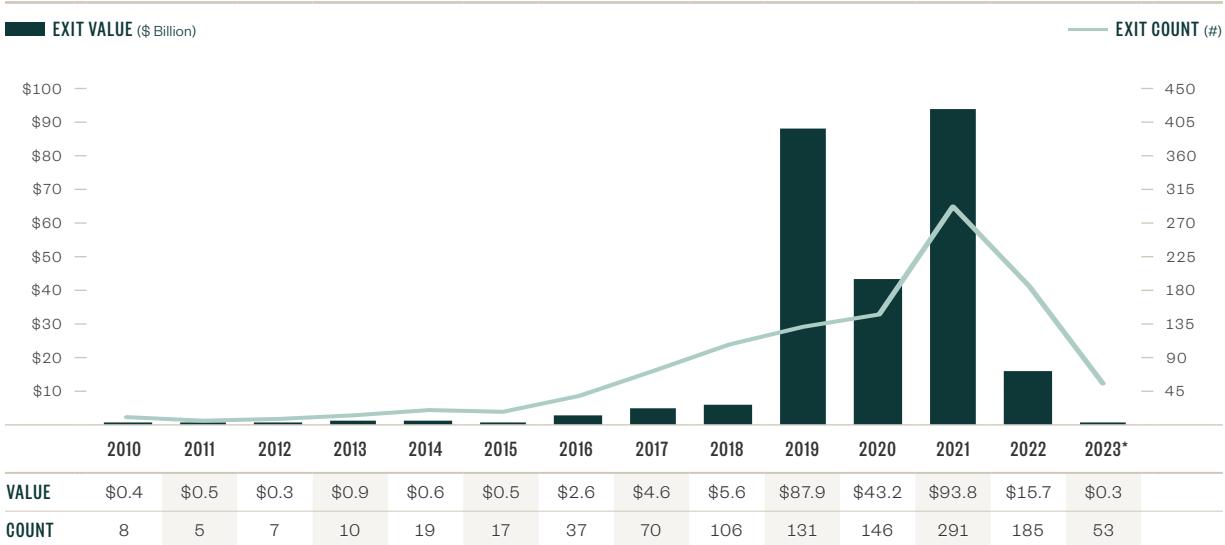
*As of 05/24/2023

FIGURE 5: Median and Average US AI & ML VC Post-Money Valuation/Revenue Multiples



*As of 05/24/2023

FIGURE 6: US AI & ML VC Exit Activity



*As of 05/24/2023



VC investment in AI & ML hit a record high in 2021 alongside the broader VC market as the recovery from the effects of the COVID-19 pandemic and a continued bull market run contributed to private market exuberance.

2022 marked the end of these conditions, and markets experienced notable downturns; this was underscored by a 37.5% decline in deal value in the space. However, despite this year-over-year (YoY) decline, 2022 marked the second-highest year on record as souring macroeconomic conditions weren't enough to deter investors pursuing the next technological frontier.

The first quarter of 2023 notched the second-highest quarterly VC deal count on record, according to PitchBook data. \$19.9 billion in deal value YTD represents half of the total value generated in 2022, indicating continued elevation in deal activity in the space.

Notably, one-third of YTD VC deal value is attributed to Microsoft's highly publicized \$10.0 billion investment in OpenAI. Numerous other players are in the space, and at least \$2 billion in VC deal value has closed each month of 2023—more than the annual total of PE deal value closed in 2022.

As AI technology evolves, VC investment has become more concentrated in the later stages, with venture-growth and late-stage VC deals accounting for more than half of total deal value each year since 2018. These late-stage deals also steadily increased their share of total deal count in the same period.

Median deal sizes reached peaks across all maturity stages in 2021, and most have since experienced corrections, declining 47.8% for venture growth, 24.5% for the late stage, and 17.5% for the early stage in 2022.

Angel and seed deals were the exception, with the median deal size growing 15.0% in 2022 and an additional 29.1% YTD.

Increased media attention and proven use cases are trickling down to the earliest stages of company formation, and investors are following. Valuation trends diverge along company stages as well, with earlier stages experiencing moderate valuation growth in 2022, while late stages saw declines as companies closer to their exit windows were more likely to incur steeper valuation cuts.

The variety of sector-focused VC firms involved in AI & ML deals has grown over the years. Software VCs unsurprisingly dominate total deal value and count, but others emerged, including health care services and systems, IT hardware, and pharmaceuticals and biotechnology. The extent to which software dominates AI & ML deal activity will likely decline slightly with the discovery and integration of new applications across industries.

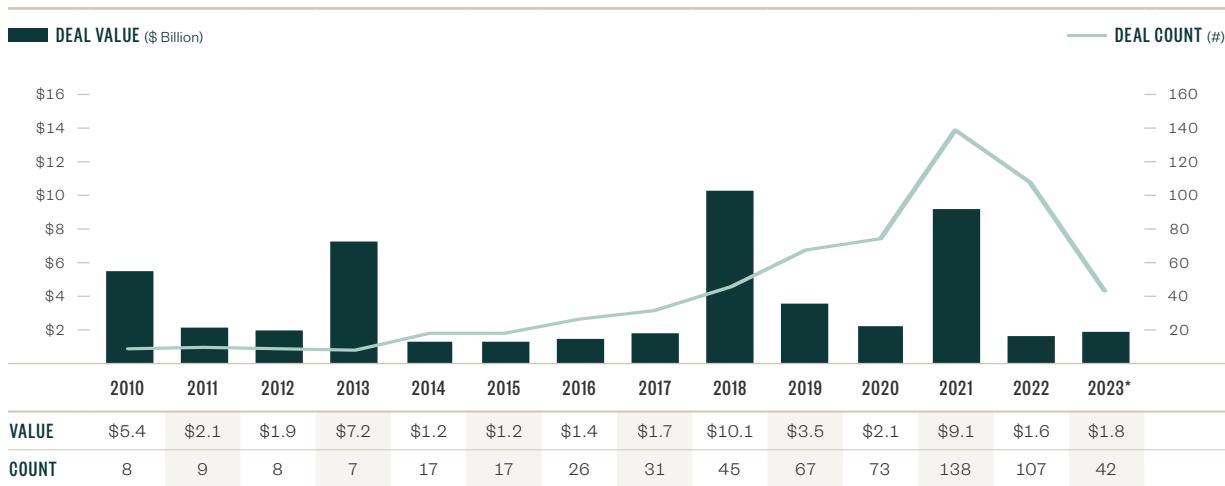
“VC and PE firms have been backing the development of these technologies for some time. The shift will be from funding the creation of the underlying technology to funding companies that leverage the technology to transform businesses and industries.”

– Bryan Schader, Partner, Cybersecurity IT & Risk Compliance Services

The VC exit environment remains stunted and is reflected in AI & ML exit activity, which took off between 2019 and 2021 with more than 100 exits each year totaling more than \$40 billion annually. This run ended in 2022 with a material drop in deal value and count, and investors remain wary of exiting as macroeconomic conditions persist in the first half of 2023.

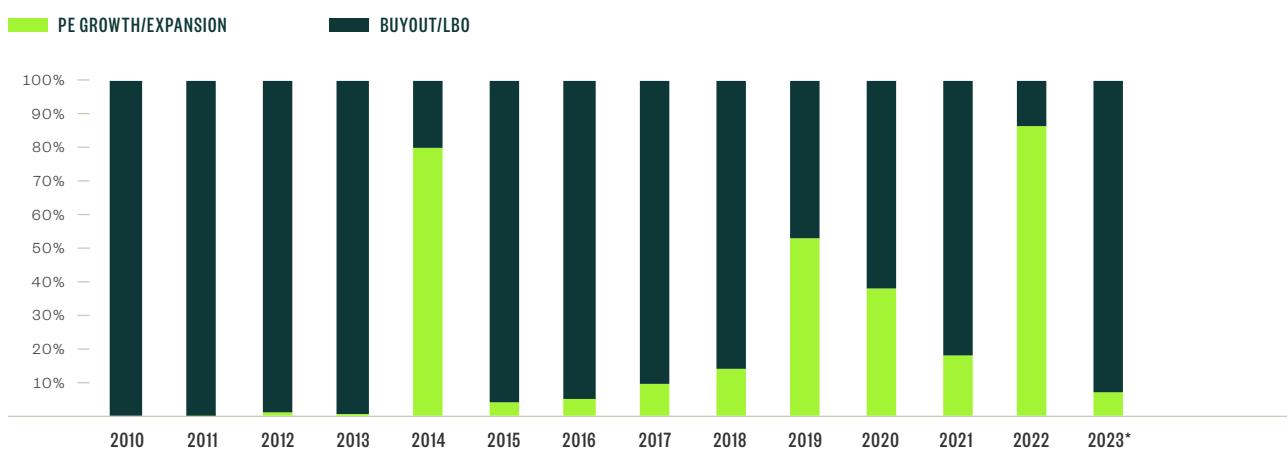
PRIVATE EQUITY INVESTMENT: ACTIVITY FLUCTUATES WITH MODERATE GROWTH YEAR TO DATE

FIGURE 7: US AI & ML PE Deal Activity



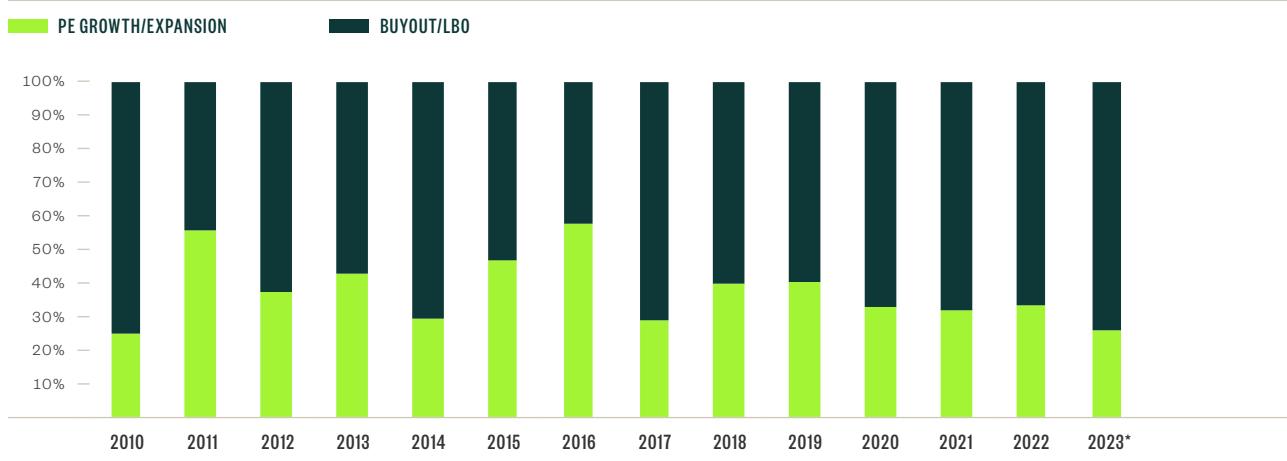
*As of 05/24/2023

FIGURE 8: Share of US AI & ML PE Deal Value by Type



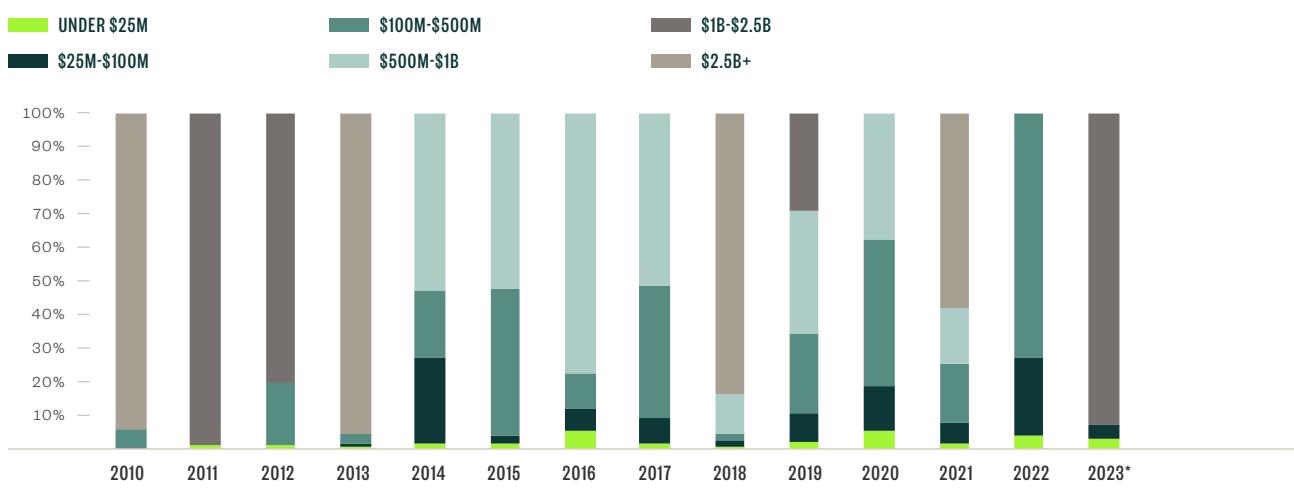
*As of 05/24/2023

FIGURE 9: Share of US AI & ML PE Deal Count by Type



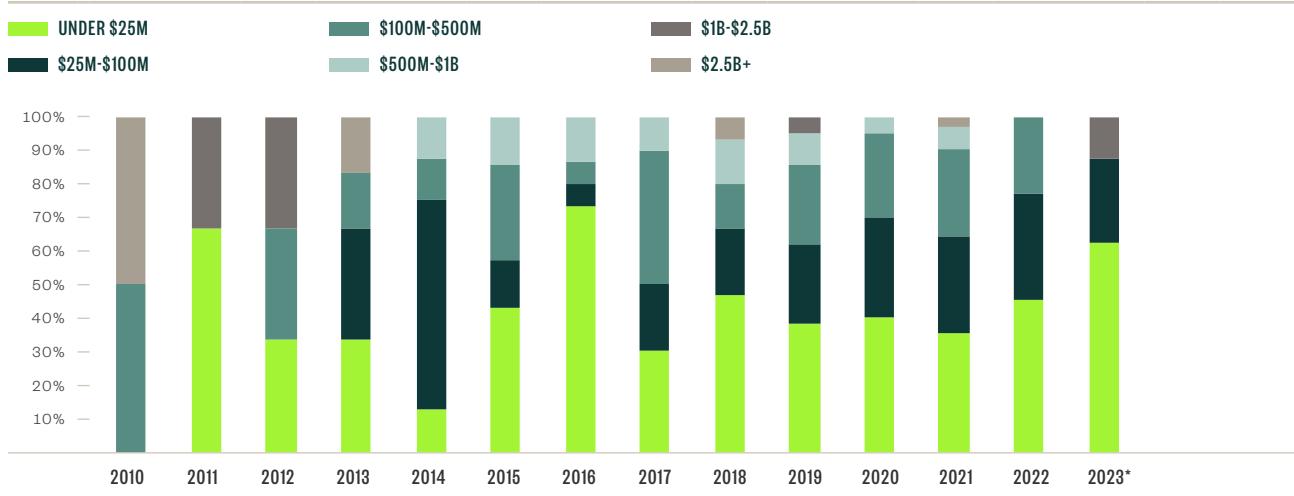
*As of 05/24/2023

FIGURE 10: Share of US AI & ML PE Deal Value by Size Bucket



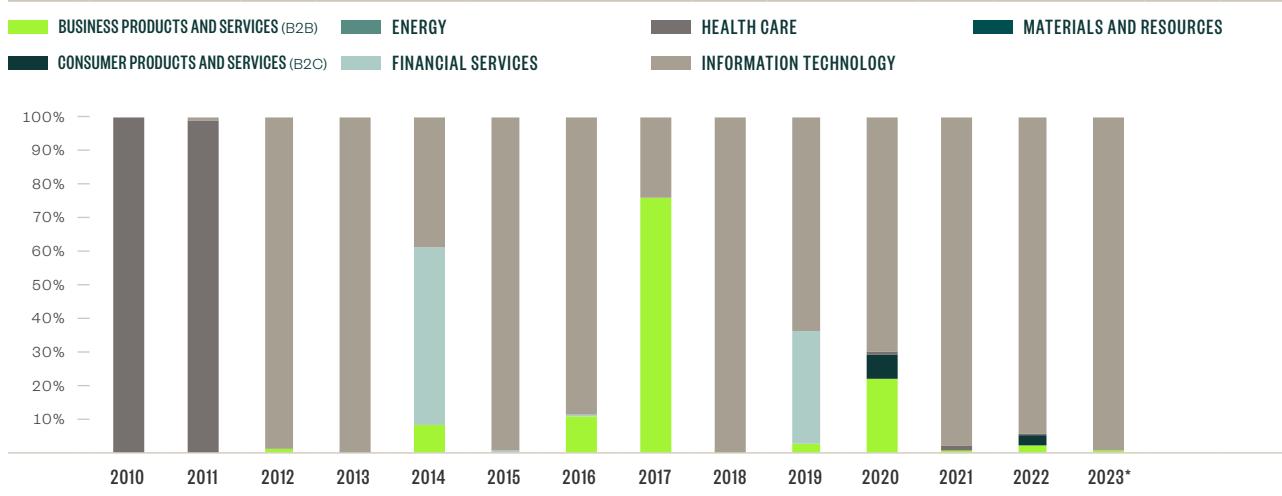
*As of 05/24/2023

FIGURE 11: Share of US AI & ML PE Deal Count by Size Bucket



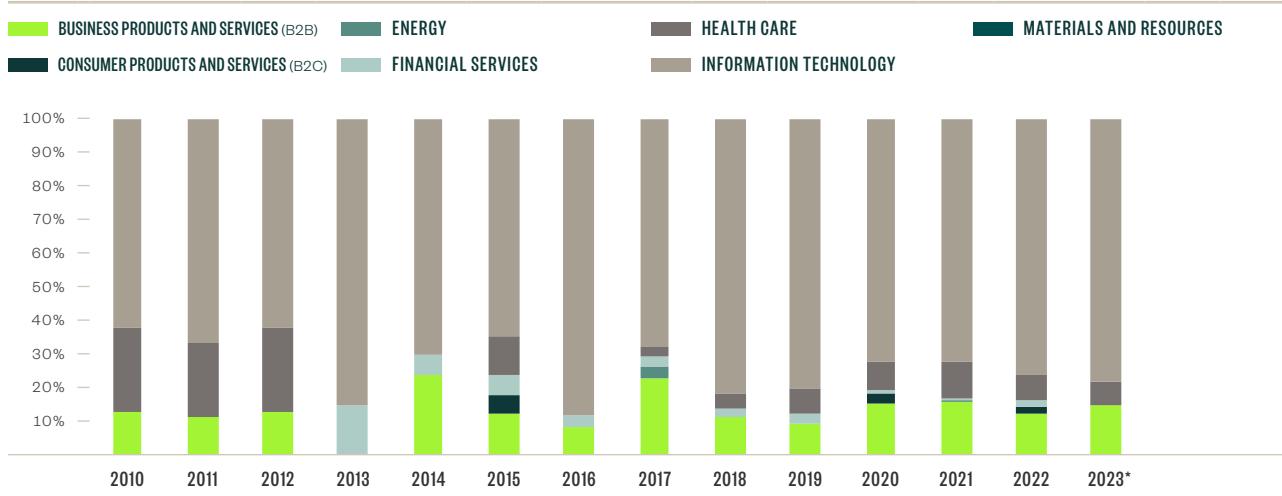
*As of 05/24/2023

FIGURE 12: Share of US AI & ML PE Deal Value by Sector



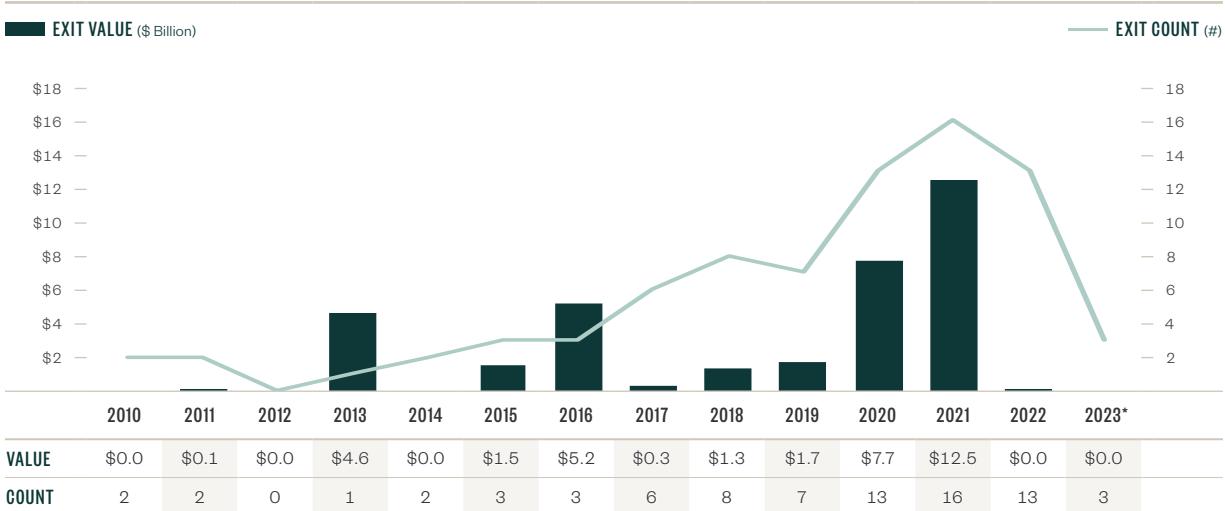
*As of 05/24/2023

FIGURE 13: Share of US AI & ML PE Deal Count by Sector



*As of 05/24/2023

FIGURE 14: US AI & ML PE Exit Activity



*As of 05/24/2023

PE investment may have a less consistent track record and smaller amount of aggregate capital contributed to the AI & ML space compared to its VC counterpart; however, firms are taking note of the technology's transformative potential.

Over the past decade, PE investment in AI has shown some significant fluctuations in deal value but a comparatively steady uptick in deal count. 2022 was the exception, with a 22.5% YoY decline in deal count. Some of this, however, can be attributed to the base effect of a strikingly high year in 2021. Deal value YTD already surpassed its 2022 total, suggesting a tepid increase in activity on the heels of OpenAI's revolution of the VC space.

PE activity is historically driven by buyouts, but growth and expansion deals emerged as an option for a minority investment providing lower exposure with proportionate risk. Fewer buyouts were completed in 2022 amid a rising rate environment, so growth and expansion deals accounted for most total deal value that year, but this trend has since reversed, with buyouts representing nearly all deal value generated YTD.

Rising competition in the space is likely to bolster minority-stakes investments as valuations rise and strong players mature, but megadeals will continue to influence aggregate capital raised. While larger buyout deals drive the most value per deal and attract more headlines, PE deal count is spread more evenly across deal size buckets, with many PE deals completed under \$25 million.

Sustained high interest rates may lead more firms to contribute greater equity to deals in favor of expensive debt, which will increase price sensitivity and may be reflected in smaller deal size trends.

Most AI deals naturally fall under the information technology sector; however, the health care and business-to-consumer (B2C) industries maintain a notable presence in total deal count. Patient-facing health care applications for AI face greater resistance due to privacy requirements and the nature of relevant data, according to the [PitchBook Healthcare IT report](#). Other applications focused on drug discovery and diagnostics show promise.

Consumer applications include expedited customer service, improved supply chain management methods, and more refined marketing strategies and content

creation. AI use cases exist within firms themselves as well, including methods for risk management as well as expediting modeling and due diligence processes.

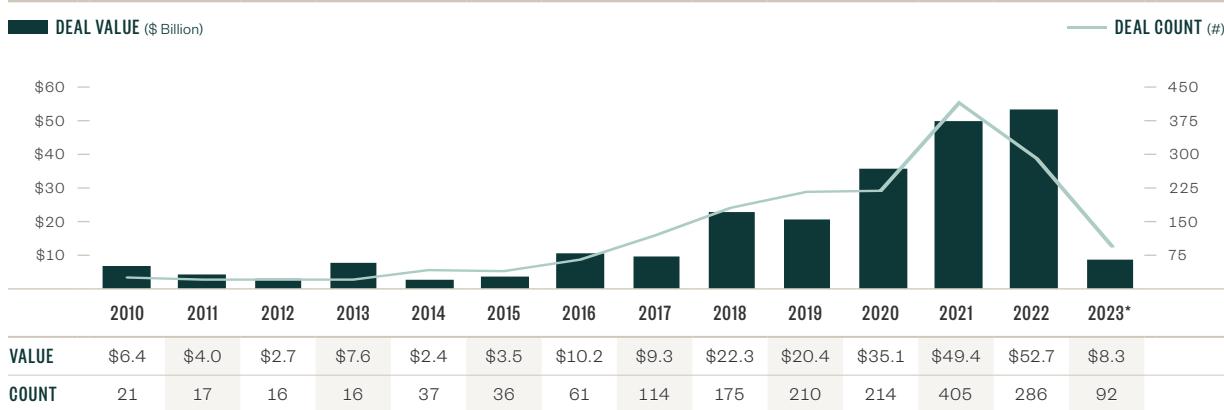
“The easiest sectors and industries or processes for applying this technology are those that require linear thinking. The technology is ready built for industries that can follow a linear process. Multi-agent support for generative AI will be on the horizon. This will be systems that use generative AI to initiate other generative AI processes.”

- Bill Armstrong, Chief Innovation Officer

PE exits in the AI space all but disappeared in 2022, and activity remains muted YTD. The few exits completed fall under the acquisition and buyout categories, with no public listings closed so far this year.

M&A INVESTMENT: A RECORD YEAR IN 2022 DESPITE MACRO PRESSURES

FIGURE 15: US AI & ML M&A Activity



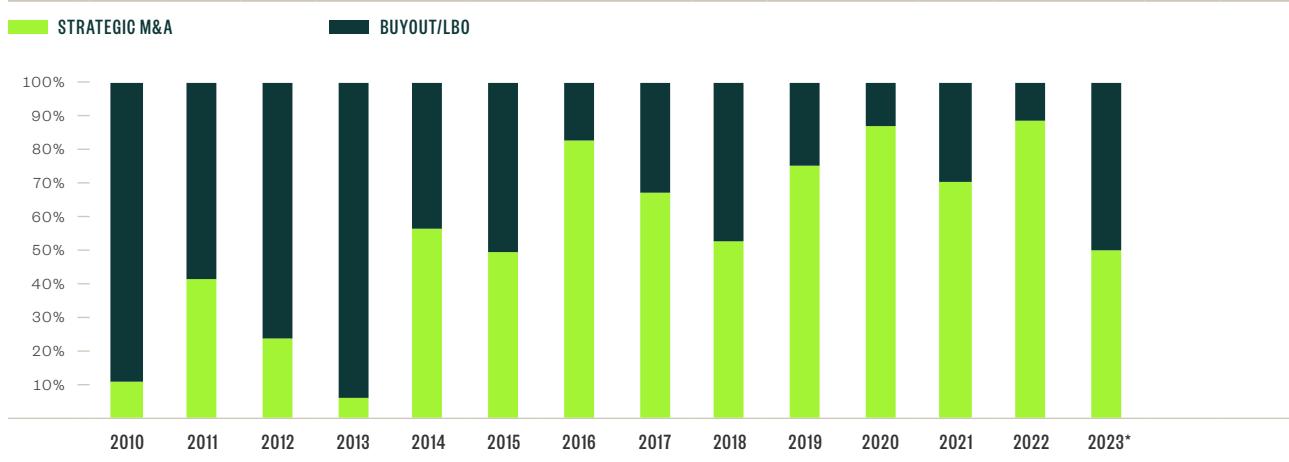
*As of 05/24/2023

FIGURE 16: Median and Average US AI & ML M&A Value (\$M)



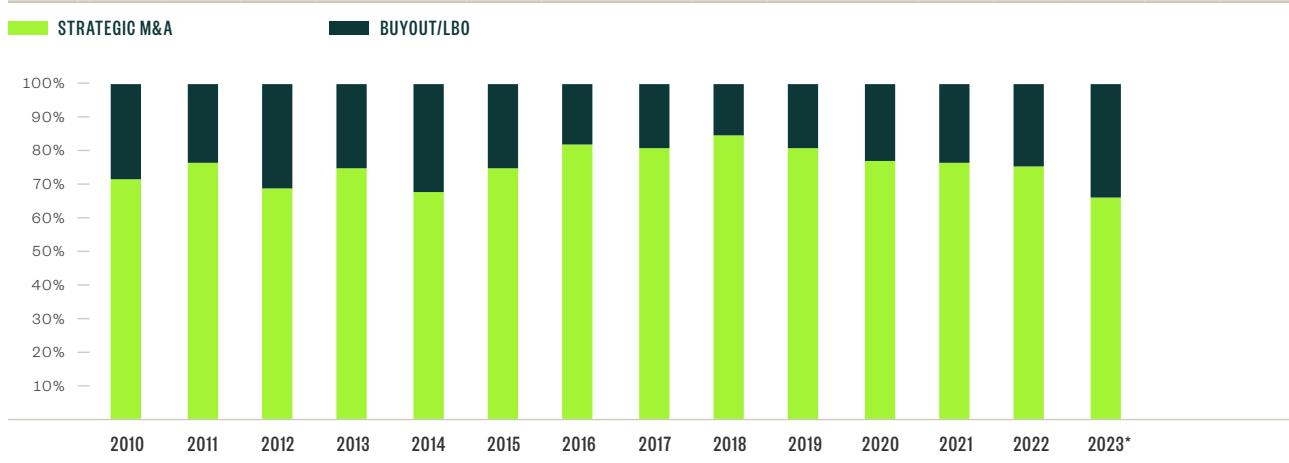
*As of 05/24/2023

FIGURE 17: Share of US AI & ML M&A Value by Type



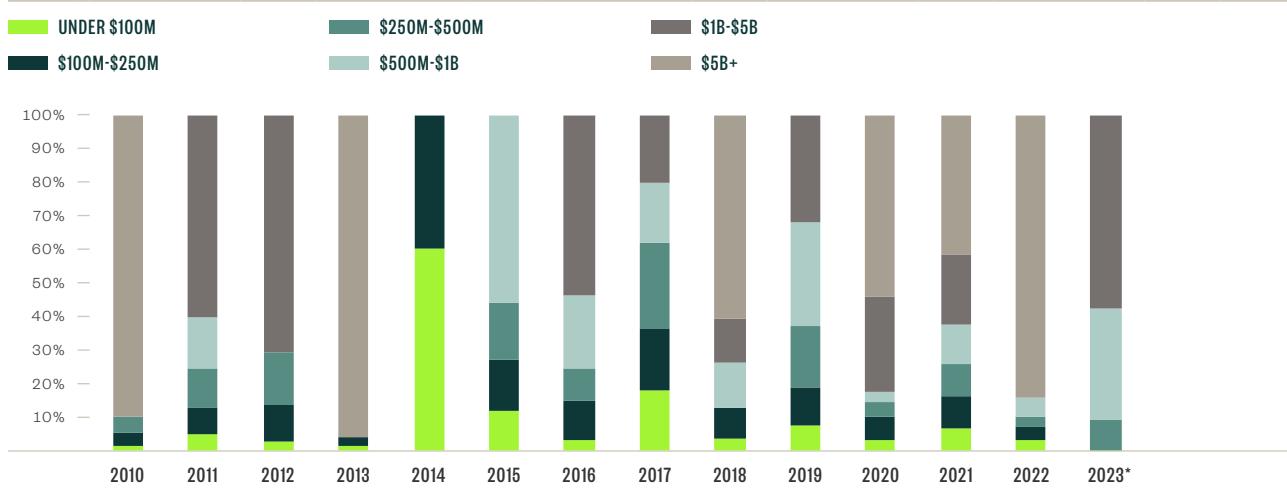
*As of 05/24/2023

FIGURE 18: Share of US AI & ML M&A Count by Type



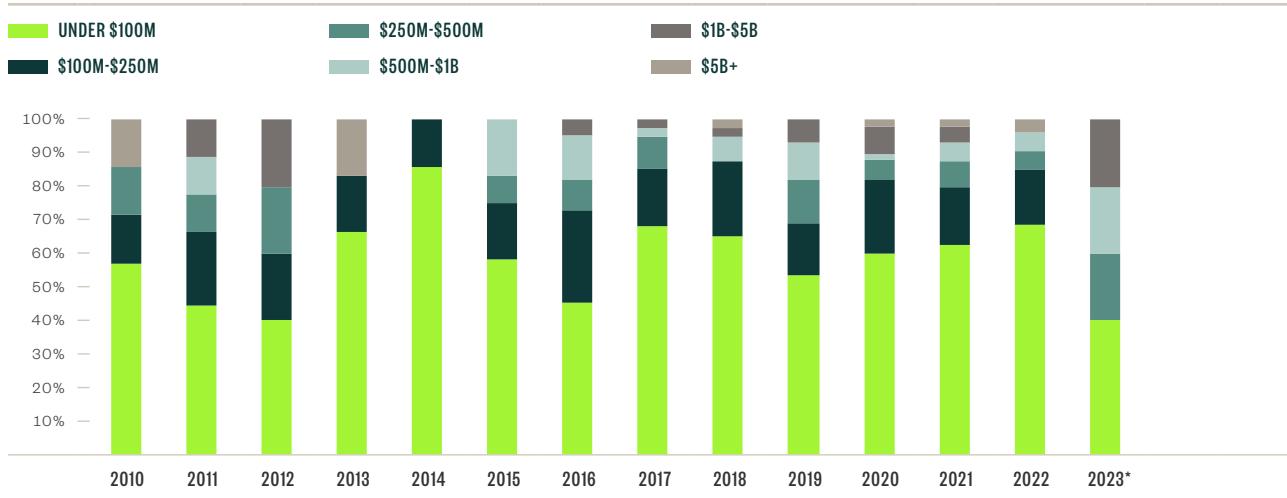
*As of 05/24/2023

FIGURE 19: Share of US AI & ML M&A Value by Size Bucket



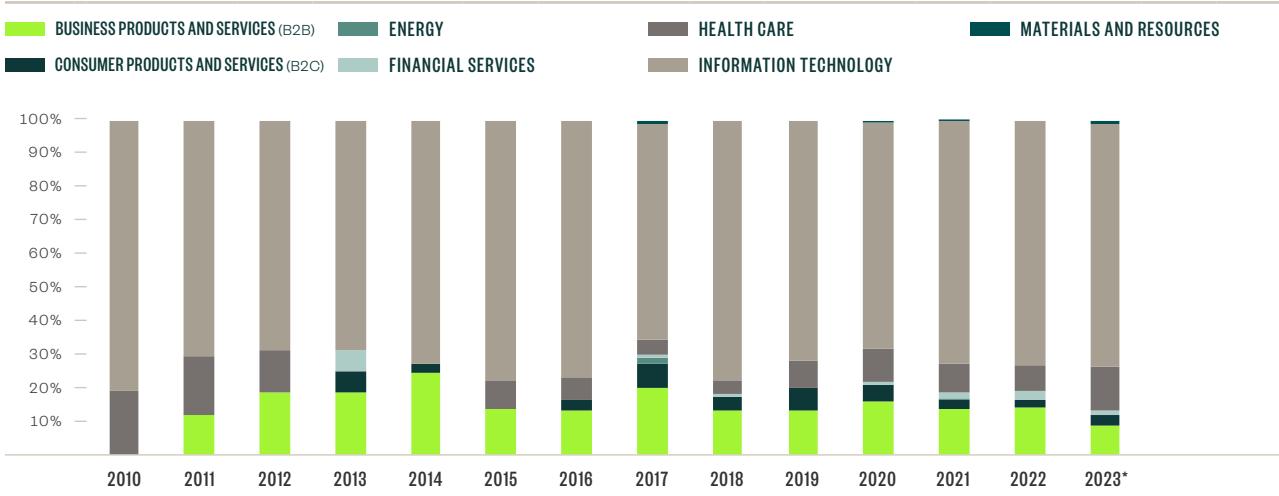
*As of 05/24/2023

FIGURE 20: Share of US AI & ML M&A Count by Size Bucket



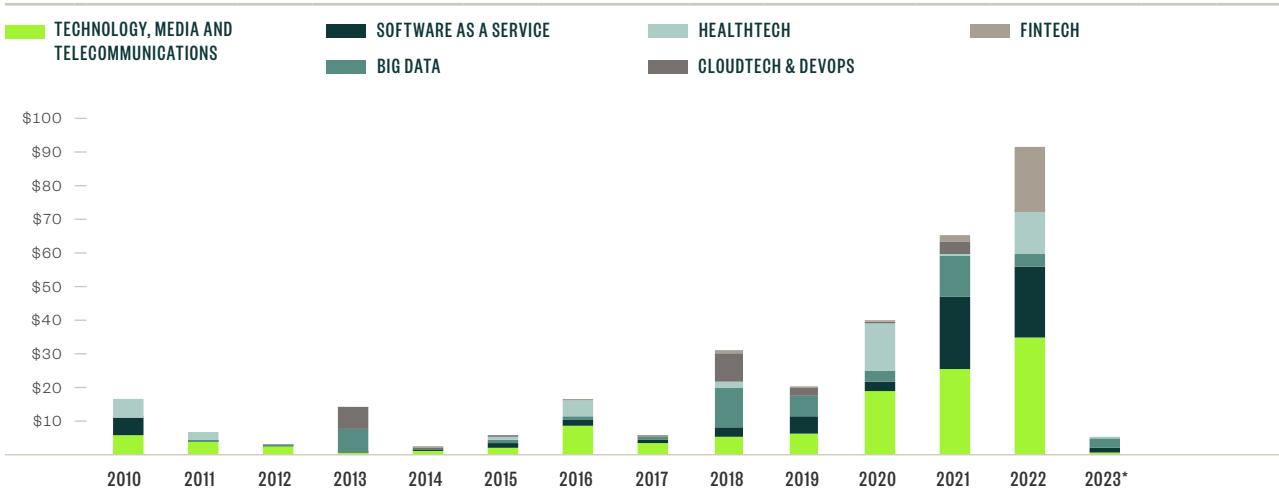
*As of 05/24/2023

FIGURE 21: Share of US AI & ML M&A Count by Sector



*As of 05/24/2023

FIGURE 22: US AI & ML M&A Value (\$B) by Top Select Verticals



*As of 05/24/2023

With a compound annual growth rate (CAGR) of 17.6% compared to VC's 34.9%, AI M&A deals were slower to grow over the previous decade than VC. However, M&A activity ramped up quickly since 2019 and represents the largest private market category in the space by a significant margin.

M&A activity totaled \$8.3 billion YTD, on the heels of a record year in 2022, during which \$52.7 billion closed despite macroeconomic conditions that lead to declines in aggregate deal value for other asset classes. Companies are eager for a competitive edge in this emerging space, and acquisitions are often the fastest way to achieve this goal. After all, development of a commercial-ready AI application can take several years and billions of dollars in investment. Organic technology development is no longer a viable option for later entrants, and the opportunity costs of missing the wave of AI are currently unknown.

Strategic transactions have emerged as a significant value driver for M&A dealmakers over the past decade, accounting for more than half of aggregate deal

value since 2016 and a record share of 88.7% in 2022. Buyouts kept pace YTD and represent half of total deal value.

Bank failures in early 2023 redirected the conversation surrounding interest rate increases and created uncertainty in loan markets that facilitate M&A transactions. Many industry experts expect a slower rate of increases from the Federal Reserve in the near term, which would alleviate some debt pricing concerns and could further bolster buyout activity.

The IT industry unsurprisingly represents the majority of M&A in the space, but the health care and B2B industries are consistently represented in total deal count as well, each with several large conglomerates seeking to keep pace with competitors.

Top verticals represented in M&A activity in 2022 include technology, media, and telecommunications (TMT), software as a service (SaaS), and financial technology (fintech). Fintech experienced the greatest increase in deal value in 2022, and its overlap with AI is producing expedited payments platforms, improved banking applications for end users, and greater accessibility of financial products and services.



SECTION FOUR

Spotlight: Big Tech Enters the Race

FIGURE 23: US AI & ML M&A Activity with Big Tech as the Acquirer



*As of 05/24/2023

Since 2019, Big Tech companies—listed on the NASDAQ 100—ramped up their AI & ML acquisitions, with a blockbuster year in 2021, during which several large acquisitions created more than \$20 billion in aggregate value. A notable uptick in deal count began in 2016, and while it fluctuated moderately, Big Tech purchasers completed at least seven AI acquisitions each year since. A similar increase in the associated total deal value took longer, but in 2019, it rose to \$2.1 billion, exceeding \$1 billion for the first time.

Big Tech's bets on AI were fairly resilient the following year in the face of economic disruptions related to the COVID-19 pandemic, with an aggregate deal value of \$1.8 billion.

Deal value then skyrocketed to \$20.8 billion in 2021, and deal count doubled to 16 as Big Tech players benefited from record-high stock prices and cheap financing due to low interest rates. Microsoft, Qualcomm, and Cisco Systems acquired three AI players apiece in 2021 for undisclosed amounts. Apple, Alphabet, and Meta also made acquisitions during the same period.

Microsoft made its first investment into OpenAI in 2019, when it wrote a \$1.0 billion VC check for the start-up to expand Azure's capabilities in large-scale AI systems. OpenAI received two additional rounds of venture funding from Microsoft since, including a \$10.0 billion round closed in January 2023.

The most recent highly publicized deal ignited a new wave of investment in the space, along with criticism and political concerns including geopolitical tensions, which stand in the way of global production and adoption.

OpenAI competitors include Big Tech-owned models like Alphabet's Bard, as well as other start-ups like Anthropic, founded by former OpenAI employees. Since its founding in 2021, Anthropic raised over \$1 billion from investors including Alphabet and the venture wings of Salesforce, Samsung, and Zoom.

Production of complementary goods and services is expanding the AI ecosystem and offers opportunities for new players to enter and drive value in the space. Demand for hardware, including semiconductor chips used in AI systems, has grown rapidly alongside generative models that have come to market.

Chipmakers like Nvidia added billions of dollars to their market capitalizations during this time. Nvidia's A100 graphics processing unit (GPU) is the most widely used chip for AI & ML systems. Amazon and Alphabet are prioritizing their own chip production to appeal to AI users, and Meta plans to launch chips as well. Intel, an industry leader in microprocessors for personal computers, plans to launch an AI chip in 2025, giving Nvidia and other manufacturers a head start for several years.

Heightened tensions between the United States and China have raised concerns relating to the global reliance on Taiwanese semiconductor manufacturing, as Taiwan's diplomatic status remains disputed by China.

Big Tech companies are entrenched in vast, sophisticated infrastructure systems and deeply invested in frontier technologies to remain competitive. These qualities make them natural entrants in the AI race. Continued M&A activity among Big Tech players is expected as fierce competition drives consolidation.

Looking Ahead: Transformational Change and AI Anxiety

Investing in AI rose in popularity over the past decade due to its potential to exponentially improve productivity through offloading tedious tasks in mass quantities and revolutionizing operations. The technology has already had significant impacts on industries including financial services, retail, and education. Applications for use in health care, insurance, and agriculture are rapidly developing. Companies can no longer ignore AI's potential. VC investment maintains momentum and will produce a pipeline of companies as excitement around AI continues. Proven use cases and commercial adoption will be key drivers of company maturation and PE deal activity over the next several years, though recent excitement has resulted in moderate growth YTD compared to 2022.

Potential monetary policy changes in the next several quarters may impact dealmakers' ability to secure debt financing for transactions. The popularity of AI technology and further investments from the largest tech conglomerates will bolster M&A activity to support competitive advantages and expedite development, though YTD activity remains low compared to the record set in 2022.

Much like trains have an upper limit on improvements due to the railway infrastructure they run on, AI applications are subject to computing power limitations. Until stronger competitors reach the market, current semiconductor producers will continue to dominate the chip market as AI use expands rapidly.

There will be increased interest in chip production, synthetic data, and other products complementary to the rise of AI models.

“From a security standpoint, this technology will allow for materially faster data-driven decision-making. This is problematic if the data or solution are incorrect as the speed of application will prevent mitigation of the security threat.”

– Bill Armstrong, Chief Innovation Officer

Legal and regulatory challenges to generative AI models will shape private investment as well, and these will most likely impact deals involving large tech conglomerates due to privacy and antitrust concerns.

Ethics and security concerns surround the technology, and investors must approach with caution, but current levels of investment indicate that these risks don't outweigh the perceived opportunity cost of the new technological frontier.

“The National Institute of Standards and Technology (NIST) AI Risk Management Framework (RMF) defines a set of privacy, security, social, and ethical considerations and recommendations for organizations to follow when developing AI-based products and services. We're closely watching the regulatory front if Congress passes laws requiring adherence to the NIST AI RMF.”

– Bryan Schader, Partner, Cybersecurity Risk & IT Compliance Services

Methodology

The scope of AI was defined using the PitchBook AI & ML vertical. M&A deal values were extrapolated. The IT Industry was defined as B2B and B2C companies with a primary focus on the development of software, hardware, or related computer peripherals and all companies whose primary focus is on IT consulting, outsourcing, or database management. Otherwise, [PitchBook's standard methodologies](#) for report datasets covering M&A, PE, and venture were used.



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