Artificial intelligence: signs of acceleration in 2023

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Christopher Gannatti, CFA
Global Head of Research

"One final investment area that I'll mention, that's core to setting Amazon up to invent in every area of our business for many decades to come, and where we're investing heavily, is ***Large Language Models ("LLMs") and Generative AI****. Machine learning has been a technology with high promise for several decades, but it's only been the last five to ten years that it's started to be used more pervasively by companies. This shift was driven by several factors, including access to higher volumes of compute capacity at lower prices than was ever available. Amazon has been using machine learning extensively for 25 years, employing it in everything from personalised ecommerce recommendations, to fulfillment center pick paths, to drones for Prime Air, to Alexa, to the many machine learning services AWS offers (where AWS has the broadest machine learning functionality and customer base of any cloud provider). More recently, a newer form of machine learning, called Generative AI, has burst onto the scene and promises to significantly accelerate machine learning adoption."*

Amazon.com CEO Andy Jassy1

When Amazon's CEO makes such a statement, we pay attention. In 1997, Amazon.com had revenues of $147.8 million; in 2022, this figure was $434 billion for Amazon's consumer business. Amazon Web Services was conceptualised in 2003, with the first services launched in 2006 and, in 2022, generated $80 billion in revenues.

Elsewhere, The Stanford AI Index Steering Committee, Institute for Human-Centered AI (one of the best annual resources on artificial intelligence), have also just released a new report. Artificial intelligence (AI) is, undoubtedly, a big topic in 2023, and this report provides an excellent resource for understanding how it is progressing. The full piece is almost 400 pages, but we wanted to highlight some key points.

ChatGPT was not the only big AI development of 2022

On November 30, 2022, ChatGPT was launched, but the Stanford AI Index report helps us remember other notable events in 2022. Our 5 favourites:

1. **February 16, 2022:** DeepMind trained a reinforcement learning agent to control nuclear fusion plasma in a tokamak2. While this doesn't mean that fusion powerplants are immediately around the corner, it does show a notable use case for AI to help scientific research in a very, very difficult area.

2. **April 5, 2022:** Google released its PaLM large language model with 540 parameters. This was an important step, showing that one avenue to improve the performance of these models was to simply train them on more data. As of this writing, we do not know how this figure compares to the number of parameters in use for OpenAI's GPT-4.

3. **May 12, 2022:** DeepMind showcased Gato, which is a model that can generalise across such activities as: robotic manipulation, game player, image captioning, and natural language generation.

4. **June 21, 2022:** GitHub makes Copilot available as a subscription-based service for individual developers. Copilot is a generative AI system that can turn natural language prompts into coding suggestions across multiple languages.

5. **July 8, 2022:** Nvidia uses reinforcement learning to design better-performing GPUs, accelerating the performance of its latest H100 class of GPU chips.

Insights on global corporate investment

AI has been one of the hottest areas for corporate investment, but Figure 1 shows the total level of investment shifted downwards, from $276.14 billion to a level of $189.59 billion in 2022 with the market volatility.

The two biggest categories comprising the level of AI investment recently has been 'Merger/Acquisition' and 'Private Investment.' Both of these categories dropped significantly from 2021 to 2022, but this is not surprising in that both of these would be expected to slow in a less certain economic environment with the US Federal Reserve quickly raising the cost of capital.

Figure 1: Global corporate investment in AI by investment activity, 2013-22

Source: Nestor Maslej, Loredana Fattorini, Erik Brynjolfsson, John Etchemendy, Katrina Ligett, Terah Lyons, James Manyika, Helen Ngo, Juan Carlos Niebles, Vanessa Parli, Yoav Shoham, Russell Wald, Jack Clark, and Raymond Perrault, AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA, April 2023. ("The AI Index 2023 Annual Report").

Historical performance is not an indication of future performance and any investments may go down in value.

One of the most informative charts in the 400-page report is the specific focal areas of investment, and how they have changed.

- 'Medical & Healthcare' was the biggest focal area in 2022, after being second biggest in 2021, trailing only 'Data Management, Processing and Cloud.'

- ‘Cybersecurity, Data Protection’ was the fourth biggest investment area in 2022 and the largest that saw an acceleration in investment, meaning investment in 2022 was actually larger than in 2021. The Russia/Ukraine conflict in 2022 created a big focus on cybersecurity.

Figure 2: Private investment in AI by focus area, 2021 vs 2022

Source: The AI Index 2023 Annual Report.

Historical performance is not an indication of future performance and any investments may go down in value.

Conclusion: even if the current ‘hype’ fades, AI will have staying power

There is little question, the first four months of 2023 have seen a massive focus on AI, and a massive focus usually leads to at least some hype and some risk of near-term overvaluation. Sometimes this is the nature of thematic investment—we all want something to get excited about, especially if economic growth and geopolitics are less positive. What is emphasised in the letter from Amazon.com CEO, Andy Jassy, and then measured in the 2023 Stanford AI Index report, is that the AI megatrend is continuing to grow and increase in its impact on society and on businesses.

1 Source: https://www.aboutamazon.com/news/company-news/amazon-ceo-andy-jassy-2022-letter-to-shareholders

2 A tokamak, put simply, is somewhat of a doughnut in shape and is a device used to contain the plasma in a fusion reaction.

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