

# What ChatGPT and the “golden age of AI” mean for investors



**Christian McCormick, CFA**  
Senior Client Portfolio  
Manager

**Generative AI, the technology behind ChatGPT and other AI chatbots, was introduced more than five years ago. What’s different now is the explosion in applications, which carry broad implications for investors.**

## Highlights



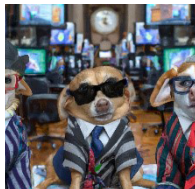
- In the field of generative AI, ChatGPT and other “large language models” have made giant leaps in how they learn and what they can create.
- This technology will be a game changer for many businesses, helping them answer questions, create content and even write code.
- We believe AI is an attractive investment theme that affects many sectors and industries — not just traditional technology stocks.

## What is generative AI?

In what seems like the blink of an eye, artificial intelligence has taken a great leap forward — and it feels like everyone is now talking to robots. New “chatbot” technology, recently popularized by a tool called ChatGPT, helps us find instant, useful answers to questions both practical (“What’s the best TV to buy for a large living room?”) and prosaic (“Write a thank-you note in the form of a Shakespearean sonnet”). But it’s just the latest in a string of groundbreaking developments in “generative AI” — which we believe will have profound implications for companies and investors alike.

While OpenAI, the company behind ChatGPT, isn’t the only player in this space, it has certainly taken the world by storm. ChatGPT gained more than a million users in the first five days after its release in November 2022, then added 100 million more by February 2023.<sup>1</sup> To put this in context, **it’s the fastest adoption of any consumer application in history.**<sup>2</sup>

### Exhibit 1: With generative AI, machine learning has reached a new level

AI > MACHINE LEARNING > SUPERVISED	AI > MACHINE LEARNING > UNSUPERVISED	AI > MACHINE LEARNING > DEEP LEARNING > GENERATIVE AI	
<i>“This is an image of a dog”</i>	<i>“Identify the dog in this image”</i>	<i>“Create digital art of chihuahuas dressed like stock brokers”</i>	<i>“Write a rhyming poem about chihuahuas reading a balance sheet”</i>
			Two chihuahuas read a balance sheet   Eyes wide in surprise, what a feat!   EBITDA and revenue, they peruse   But they can’t comprehend the numbers they choose

Source: OpenAI, Writer Inc.

So just what is generative AI? It's not a single program or tool — rather, it's an umbrella term for a form of machine learning (ML) called “deep learning” that has been in use for some time, generating little public interest until now. Meta Platforms, Microsoft, Google and others started creating private and open-source advanced “generative pre-trained transformer” (GPT) models in 2018. Generative AI uses models trained on sets of data to perform certain tasks — including creating text or images — and/or make predictions, all without human direction. And as recent news headlines have shown, these systems recently made a big technological leap in how they learn and what they're able to produce.

Most early ML models involved *supervised* learning, in which humans were needed to classify data — for example, identifying an image as a “dog” or a social media post as “political.” But the notable new developments in generative AI involved *unsupervised* learning, in which the model makes its own predictions and calculations based on the massive amounts of data fed into it. That means the technology has moved from being able to *identify* a dog in an image — the famous “chihuahua or blueberry muffin?” test — to creating an *image* of a dog or writing *poetry* about a dog (Exhibit 1).

### Why it matters for investors

This technology is a game changer for many businesses. ChatGPT and other large language models (LLMs) are trained on immense sets of text data to execute specific tasks, such as finishing a sentence or completing a line of code. LLMs have billions of variables (parameters) that the models can change as they learn, increasing their accuracy rate and expanding the business use cases. For example, an AI-driven chatbot might be able to answer 90% of questions from banking customers, freeing employees to spend more time selling services or provide a better in-person experience to the bank's highest-value clients.

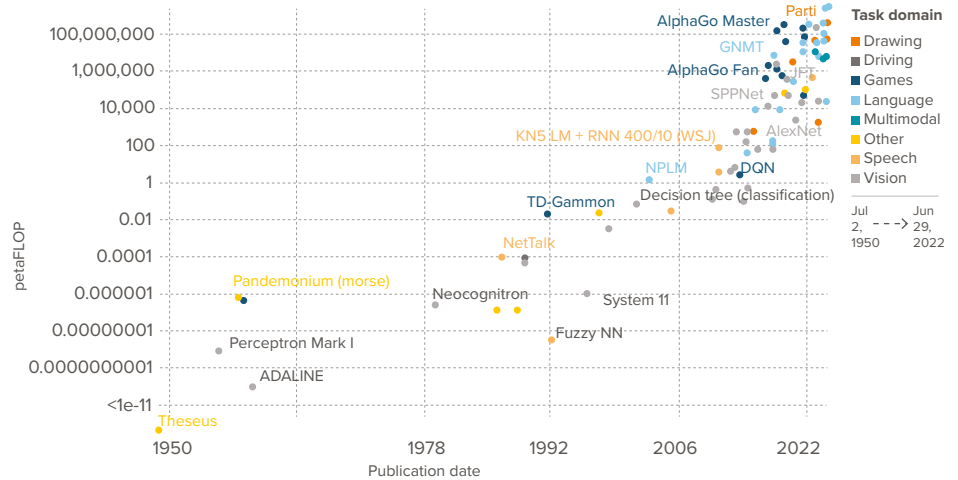
Imagine all the possibilities for this type of technology. Companies that need to create written materials — simple product descriptions, technical manuals or even answers to questions like “Why did my insurance rate go up?” — will be able to do it faster and cheaper than they could using human labor. For software companies, generative AI technologies can perform the grunt work of basic coding, allowing programmers to engage in more-important and higher-value-added programming tasks.

Generative AI can be used to generate text, images, voice and movies. This could aid or even replace time-intensive human tasks, such as designing logos, illustrating scenes and designing products. Generative AI models will be integral to the next generation of augmented and virtual reality–related technology in gaming; visual interactive entertainment; and business simulations, such as “digital twins.” Indeed, there are numerous immediate applications of the technology across a variety of sectors and use cases. The top right quadrant of Exhibit 2 shows that the types of tasks AI can perform has increased significantly in recent years (and so has the computing power required).

Generative AI can replace time-intensive human tasks, such as designing logos, illustrating scenes and designing products.

For investors, we believe the technology is worth a closer look. Generative AI has the potential to significantly enhance customer engagement, free employee resources for more value-added activities and improve company margins. At the same time, companies that do not have a well-thought-out or well-executed game plan around the technology may find themselves disrupted, rather than being the disruptors.

**Exhibit 2: A big leap in computing power led to more uses for AI**



As of 2022. Source: OurWorldInData.org. Computation is estimated based on published results in the AI literature and comes with some uncertainty. The authors expect the estimates to be correct within a factor of 2. A floating point operation (FLOP) is a type of computer operation. One FLOP is equivalent to one addition, subtraction, multiplication or division of two decimal numbers. A petaFLOP is  $10^{15}$  FLOPs.

“ Now we have generative models for proteins. We have generative models for chemicals. We have generative models for language, for text. We have generative models for images and video. As you know, we’re working on generative models for 3D. **You won’t be able to populate the world’s Omniverse, the metaverse, with human-engineered content.** It has to either be perceived through computer vision, or generated, or a combination of both.”

– Jensen Huang, NVIDIA CEO<sup>3</sup>

But generative AI isn’t all fun and games. The widespread adoption of the technology raises important ethical questions and legal issues, such as copyright and licensing issues for AI-created images. Chatbots can also produce incorrect, inconsistent or even inappropriate answers — a result of their using the entire internet as their training set.

For many companies applying the technology to specific use cases, this will be less of an issue, and they can further train the machine with more specific data sets and fine-tuning. Indeed, OpenAI is hoping that by initially opening ChatGPT for broad public use, it can better help train the model with real-time feedback from users.

For other companies — particularly those in the social media sphere — there could be problems, particularly if chatbots facilitate the dangerous spread of false information. As we have seen numerous times with the advent of a new technology, the applications and uses are introduced first, and then regulation has to catch up. This is why it’s important for investors to be selective in these early days, favoring a bit of caution as opposed to taking an “all-in” approach.

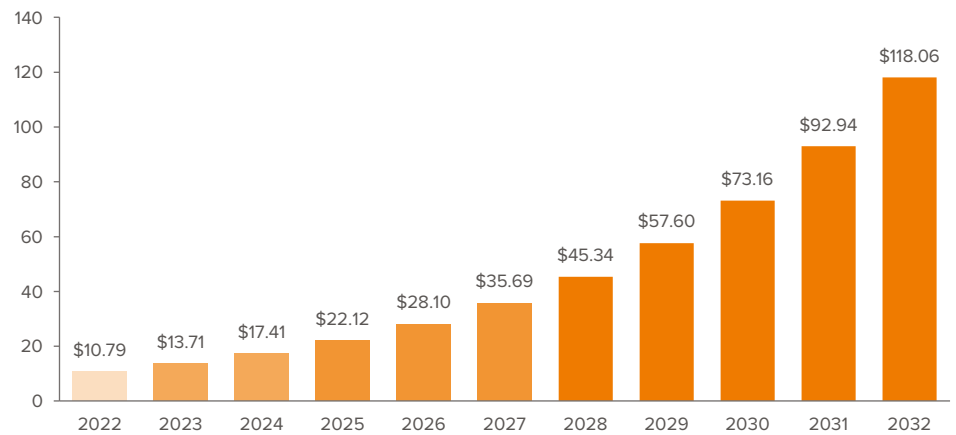
**Generative AI will be a key piece of AI-driven transformation and innovation**

We believe investors should not view the difficult performance environment for technology stocks in 2022 as an indication that AI-driven transformation is slowing or that the importance of AI-related technological advancements has decreased. Rather, we are witnessing increasing use of AI by a range of companies for cost reduction, revenue enhancement and improved customer engagement. The number and variety of use cases continues to grow rapidly (Exhibit 3) — perhaps evidence that we are entering a “golden age of AI.”

We expect to see improvements in the quality and diversity of generated content; new types of generative models; and broader application in a variety of industries, such as health care, finance and transportation. Additionally, AI should become more accessible to a wider range of users through user-friendly interfaces and tools. The precise future of generative AI is hard to predict, but we are optimistic it will be a key piece of AI-driven transformation and innovation. We advocate viewing AI as a high-conviction theme that crosses sectors and industries, as it is now being adopted well beyond traditional technology stocks.

**Exhibit 3: The generative AI market could grow 27% annually over 10 years**

Predicted market size (2023 to 2032, USD billions)



As of 12/22. Source: Precedence Research. Compound annual growth rate = 27.02% from 2023 to 2032.

<sup>1</sup> “ChatGPT reaches 100 million users two months after launch,” The Guardian, 02/02/23.

<sup>2</sup> “ChatGPT sets record for the fastest-growing user base – UBS analyst note,” Reuters, 02/01/23.

<sup>3</sup> “Why Nvidia CEO Jensen Huang says this is generative AI’s moment,” VentureBeat, 02/25/23.

All investing involves risks of fluctuating prices and the uncertainties of rates of return and yield inherent in investing. All security transactions involve substantial risk of loss.

**Past performance does not guarantee future results.** This market insight has been prepared by Voya Investment Management for informational purposes. Nothing contained herein should be construed as (i) an offer to sell or solicitation of an offer to buy any security or (ii) a recommendation as to the advisability of investing in, purchasing or selling any security. Any opinions expressed herein reflect our judgment and are subject to change. Certain of the statements contained herein are statements of future expectations and other forward-looking statements that are based on management’s current views and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in such statements. Actual results, performance or events may differ materially from those in such statements due to, without limitation, (1) general economic conditions, (2) performance of financial markets, (3) interest rate levels, (4) increasing levels of loan defaults, (5) changes in laws and regulations and (6) changes in the policies of governments and/or regulatory authorities. The opinions, views and information expressed in this commentary regarding holdings are subject to change without notice. The information provided regarding holdings is not a recommendation to buy or sell any security. Fund holdings are fluid and are subject to daily change based on market conditions and other factors.

©2023 Voya Investments Distributor, LLC • 230 Park Ave, New York, NY 10169 • All rights reserved.

IM2766721 • CMMC-CHATGPT • 220338 • 030923

voyainvestments.com

