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## ARTIFICIAL INTELLIGENCE: INVESTING IN TECHNOLOGY TRANSFORMATIONS

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The market's obsession with artificial intelligence or "AI" has been on full display this year. As the primary designer of the GPUs that power compute-intensive AI applications, Nvidia remains the bellwether company representing this phenomenon. Nvidia's stock gained 149% during the first half of 2024. For a brief period, it became the most valuable company in the world with a market capitalization in excess of \$3.3 trillion, which is roughly equal to the GDP of Great Britain. And Nvidia is not alone. Many other companies with ties to the AI infrastructure build-out or emerging AI applications also saw meaningful stock price appreciation over the first part of the year.

AI as a concept is not new. The basic building blocks have been around for decades, and different forms of machine learning (a subset of AI) have been successfully deployed in various applications for years. Netflix's famous "recommendation engine" is a perfect example of how we are already exposed to machine learning algorithms in our everyday lives. Current applications aside, the general availability of ChatGPT in 2023 was hailed as an inflection point of sorts in AI's evolution from a rigid rule-based mechanism toward a robust generative intelligence. At a minimum, it propelled AI into mainstream consciousness and generated a sense of "FOMO" (fear of missing out) in corporate board rooms that should support robust near-term investment.

Similar historic shifts in the prevailing technological and communication architecture—e.g., mainframes

to PCs, analog switched telephone network to digital communication protocols (aka, the Internet), client/server to cloud computing etc.—suggest AI will have a substantial long-term impact on the way businesses operate. For instance, prior to the 1990s few people could comprehend a concept called a "website" or envision what purchasing products and services "online" might look like. Now, thanks to the Internet, we live in a world where we have access to millions of products with a few clicks of a mouse. And we are often disappointed when our order fails to show up at our doorstep within a couple of days.

### AI WILL HAVE A SUBSTANTIAL LONG-TERM IMPACT ON THE WAY BUSINESSES OPERATE.

But the technological and economic transformation spurred by the new web architecture did not happen overnight. Technology revolutions rarely do. It required massive investment in fiber and computing power, standardization of communication protocols, and the development of many new software applications to make this new, far-reaching digital world accessible to the masses. During this process some businesses thrived, some were rendered irrelevant (R.I.P. Blockbuster Video); but most simply took years to fully adapt to the new reality. This adaptation process required a significant investment in technology and business process reorientation. We suspect AI will lead to an environment offering similar business opportunities and threats.

History also suggests that in the early stages of a paradigmatic technological shift, it is generally lucrative to own the proverbial "pick and shovel" providers. Those companies that enable the build-out of the infrastructure that allows the technology to take shape. For instance, Cisco Systems was a key provider of the networking technology that formed the backbone of the Internet as we know it today. In the early build-out of the Internet (1992 to 2001), Cisco's revenues increased from \$183 million to \$22 billion – a 120-fold increase over 10 years.

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**YOUR PORTFOLIO CONTAINS POSITIONS IN SEVERAL BUSINESSES THAT PROVIDE KEY ENABLING TECHNOLOGIES FOR AI INCLUDING COMPANIES THAT SELL HIGH-PERFORMANCE SERVERS, UNIFIED DATA STORAGE, AND LOW-LATENCY NETWORK SWITCHING.**

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You also own businesses that provide reliable, low-cost sources of energy to power the increasingly energy-intensive nature of the accelerated computing required to train sophisticated AI models. It is important to note that we have owned each of these companies for many years and that they have profitable and growing businesses outside of the emerging opportunities in AI. AI applications, however, should be nicely additive to each company's long-term growth opportunity.

Though many of the portfolio companies already use rules-based algorithms to improve customer outcomes and drive efficiencies, we suspect they will adopt new, robust AI capabilities as they become more broadly available. Those businesses with deep, proprietary datasets arguably stand to gain the most as they use AI to mine their unique content for

actionable insights. We are seeing early signs of this phenomenon across the portfolio. For example, Autodesk (ADSK) is using AI to quickly generate functional 3D shapes from a variety of disparate inputs including 2D images, text descriptions, and pictures. Their AI model is trained on 3D design data rather than commoditized external imagery and is, therefore, capable of reasoning on the internal structure of an object. Over time, this capability will allow for greater engineering velocity and efficiency as well as support for a broader developer ecosystem.

While it's easy to get caught up in the transformational potential of AI, from an investment perspective it is absolutely critical to remember that no matter the state of the technological landscape, the potential of any investment portfolio always rests on the status of the portfolio relative to two fundamental truths:

- (1) *The expected return under a reasonable set of assumptions, and*
- (2) *The fundamental health of the portfolio holdings.*

With regards to the first item, the forward return outlook is attractive for your portfolio. It remains nicely above our long-term target rate of return. And, with few exceptions, your portfolio holdings continue to demonstrate excellent fundamental progress. So, whether the long-term value-creating impact of AI proves to be minor or substantial, we are optimistic about the return outlook for the portfolio over the next 5-7 years.

As always, thank you for allowing us to make long-term investment decisions on your behalf.

*Note: DGI portfolios do not hold Nvidia, Netflix, or Cisco. ChatGPT is a product of OpenAI, a privately-held company.*

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#### **ABOUT DISCIPLINED GROWTH INVESTORS**

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