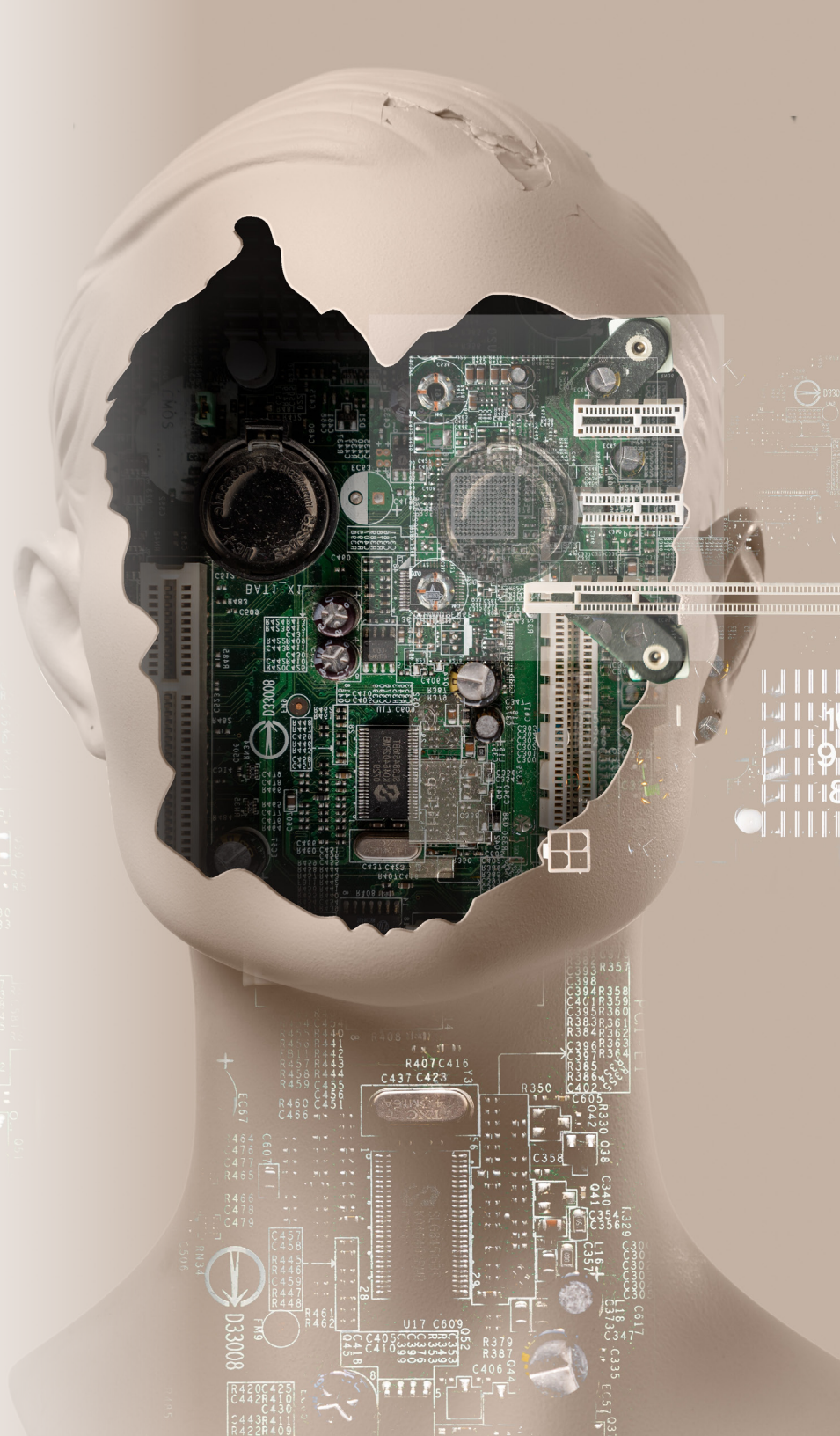
CREWCIAL® PARTNERS

Q1 2023 | Quarterly Commentary

WHEN ANDROIDS DREAM OF ELECTRIC SHEEP

THE AI REVOLUTION AT OUR DOORSTEP

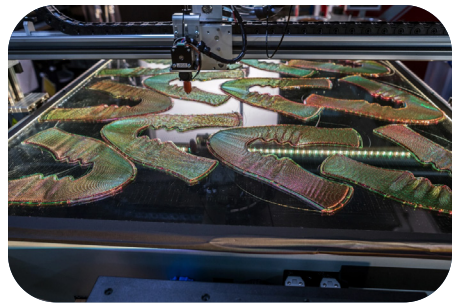


The Android

The ability to assimilate and optimize newer technologies and approaches to innovation define the ultimate winners and losers across all broader economic cycles. Those who do not adapt are left behind, period. This has been true of every market from time immemorial. Better ship-building techniques helped the most successful near-eastern civilizations better exploit the rich mineral resources and integrate the trading networks of the western Mediterranean[1]; the pursuit and embrace of innovative manufacturing processes keeps Nike on top as the premier sneaker brand[2]. From Amazon's autonomous mobile warehouse robots[3], which help to facilitate today's relative streamlined and frictionless "one click" shopping experience pioneered by the multinational juggernaut, to Google's use of mined data to curate search options, technological advancements continue to simplify our lives while muddling the social and ethical equation. Presently, it appears the next exponent in value creation rests in replicating what makes humans human, intelligence itself.

However, intelligence, not for lack of a better word, is complicated.

As humans, we have a historical tendency towards myopia, and every revolutionary shift in our paradigm of reality triggers an impulse to preserve the status quo. Because, while all such innovation comes from the human mind, it sometimes outstrips our collective ability to fathom the implications, leading to fear and uncertainty. To the uninitiated, any sufficiently advanced technology is indistinguishable from magic, a traditionally inhuman power harnessed towards our own ends, usually a double-edged sword in the classic fairy tales. However, magic is less "real" than it is a warning of human intelligence running away with itself towards hitherto unseen horizons.



On September 25, 2022, Eliud Kipchoge, the world's best marathoner, broke his own record by shaving off 30 seconds from his previous time of 2:01:09. The running community couldn't help but notice Kipchoge sporting Nike's "Air Zoom Alphafly Next% 2," the latest iteration of an experimental design called the "Vaporfly Elite FlyPrint," which Kipchoge and Nike had been developing together since early 2018. The shoe leverages 3D technology to reduce weight while adding bespoke functionality that mirrors the runner's unique feet and mechanics.

Meanwhile, LiDAR technologies had also been evolving, shrinking from the large size observable atop a Google Street View mapping van to fit inside the bump of the iPhone 12's camera enclosure. With recent developments in AI, everyone can soon have the Kipchoge treatment by ordering runners computationally designed with a custom 3D-printed upper from a scan of their feet and reference to their digital medical records.

The creative application of seemingly unrelated technologies will continue to redefine economic winners and losers. Thoughtful investors must also channel their inner creativity when seeking to identify business operators or money managers with a keen eye on the horizon. In the performance shoe business, survival may mean being the first to market with an app-based concierge that helps users build a shoe uniquely constructed to keep the pressure off their extensor tendons and on the competition.

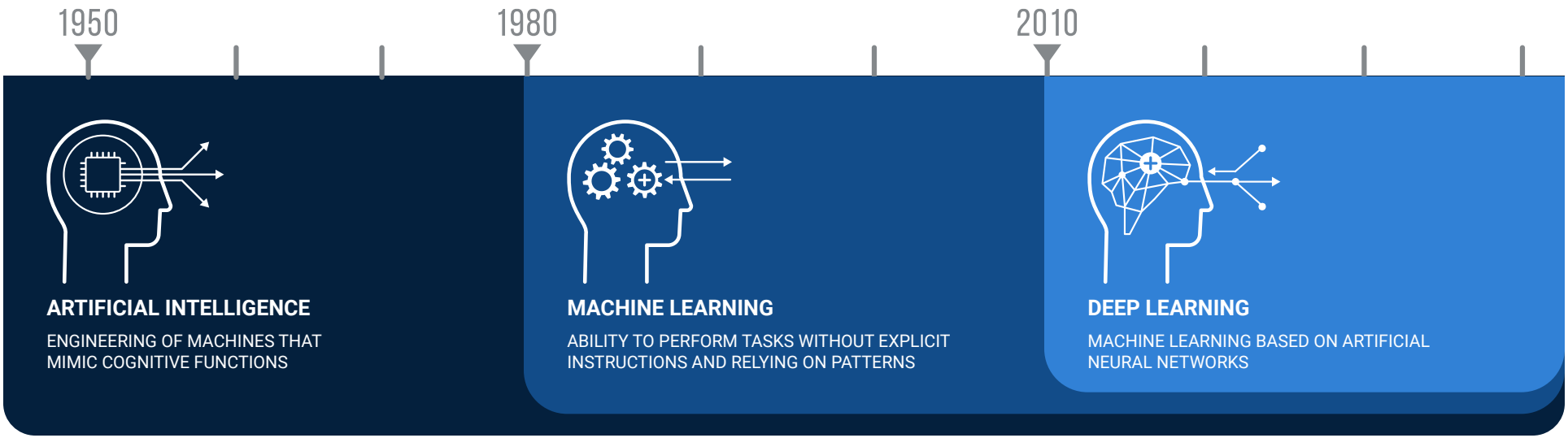
Artificial Intelligence (AI) is a branch of computer science that focuses on the development of algorithms and systems that can perform tasks that typically require human intelligence, such as visual perception, speech recognition, decision making, and language translation. The goal of AI research is to create systems that can perform tasks that would normally require human intelligence, such as understanding natural language, recognizing objects in images, and playing complex games.

AI can seem like magic, making things happen that seem mysterious and fantastic. But, while it might appear this way, it is based on scientific principles and technology derived from the human intellect. The "A" in AI is a modifier of paramount importance. An artificially intelligent system is by definition not intelligent in the way a human is; intelligence is based on a lived experience of the world in which it is operating. Artificial intelligence is not intelligence per se, but a facsimile of intelligence.

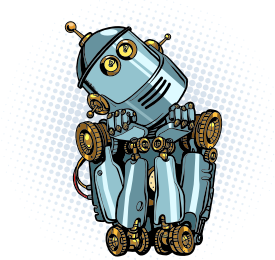
This is not to say, however, that a powerful facsimile of intelligence, stripped of personal obligation, desire, biases, agendas, and biological limitations, cannot be a tool of unprecedented power across all realms of human endeavor. Today, AI is largely based on machine- and deep-learning techniques, while deep learning has become the dominant approach in many newer applications.

Machine learning is a type of computer program that can "learn" to perform tasks without being explicitly programmed to do so, allowing a computer program to improve its performance by analyzing data and recognizing patterns. For example, a machine-learning program might be trained to recognize images of cats and dogs by analyzing a large dataset of labeled images. Once the program has learned to recognize the patterns associated with each animal, it can apply that knowledge to new images, identifying whether they contain a cat or a dog.

Deep learning is a specific type of machine learning that uses artificial neural networks with multiple layers (hence the term "deep"); a neural network is a computer system modeled after the human brain, with many interconnected "neurons" able to process information.



The Dream



We challenge the reader to find another AI-centric article in 2023 that took this many words before pointing to the elephant in the room, ChatGPT, a language model developed by OpenAI that has been trained on an enormous amount of text and data from the internet, including books, news articles, social media posts, and emails. By analyzing this data, the model has learned to understand the patterns and structures of 100 spoken languages[4], which enables it to generate responses to and, in many cases, accurately answer questions. It generates such answers from users inputting natural language descriptions—i.e., writing text in one's native language—called "prompts." The program can be used to answer questions on a wide range of topics, generate text in different styles and tones, and even carry on a conversation. Perhaps most importantly, it is constantly learning and improving based on the feedback it receives from users.

In its own words, ChatGPT has the potential to revolutionize the way we interact with computers and other digital devices, and how we produce and consume content. The model can be used to develop intelligent chatbots, virtual assistants, and other applications that require natural language processing capabilities[5]. Much like the iPhone is a symbol for a more connected, digital world, due to its ubiquity and being first on the broader public scene, ChatGPT may prove metonymous with the 'AI revolution.'

As the technology develops, it is increasingly expanding into the realm of content creation beyond the textual. Advanced AI such as Midjourney and DALL-E, and now newer versions of ChatGPT, are able to use prompts, sometimes in cross-collaboration[6], to develop refined inputs able to produce images and artwork with a high degree of accuracy and level of professionalism. Such image generation has even been expanding into the world of video[7]. In fact, some of the latest box-office blockbusters can attribute a significant part of their success to a stunning visual fluency aided in large part by AI[8]. (This also leads to a host of wider issues, from copyrighting for the artists whose work these models are trained off, to the very nature of 'art.'[9])

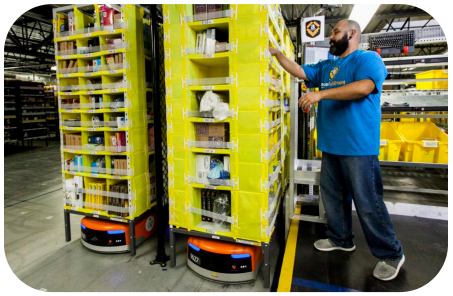
To create arguably the most visually immersive movie-going experience ever, revolutionary filmmaker James Cameron (who owns multiple patents for underwater filmmaking) leveraged multiple machine-learning technologies. These technologies were used to reduce underwater blurring, capture minute shifts in actors' facial performances, and better integrate live acting with computer-generated environments, using techniques such as 3D modeling and precise timing. Interestingly, James Cameron has directed three of the five highest-grossing movies of all time: Titanic (#4 with $2.26 billion), Avatar: The Way of Water (#3 with $2.32 billion), and Avatar (#1 with $2.92 billion).

However, novel content creation is just one area of current application, albeit the one that presently defines the zeitgeist. For example, healthcare is a notable area primed for optimization from newer-generation AI programs, from diagnostics to treatment. Based on a report by the National Library of Medicine on the rise of artificial intelligence in healthcare[10], the input of large amounts of data able to be quickly and intelligently processed can be used for detailed personal profiling to enhance the understanding of certain behaviors while predicting healthcare trends. Such applications extend to analyzing medical images or correlating symptoms and biomarkers from medical records with the characterization and prognosis of the disease—in other words, accurately diagnosing illness and suggesting effective treatment options. Already, AI is outperforming doctors in some areas of diagnosis, such as breast cancer detection in certain circumstances[11], and in terms of speed, having recently diagnosed a 1 in 100,000 condition in a matter of seconds[12].

Like electricity and the internet, these technologies will eventually permeate all aspects of the human experience. More generally and perhaps most simply, one of the main benefits of AI is its ability to efficiently automate tedious or rote tasks that nonetheless previously required a level of human attention, freeing up time for humans to concentrate on higher-level thinking and problems requiring greater creativity. Such mechanical tasks are ripe for human error, as attention and interest can be difficult to engage the more repetitive the activity. In fact, even before the most recent breakthroughs, a 2019 survey of global business and IT leaders by MIT Technology Review Insights found widespread support for the emerging link between AI and creativity. Nearly half of the 2,300 respondents (47%) strongly agreed with the statement that, due to AI, "We could dedicate more time to thinking creatively about the business challenges we (and our clients) face.[13]" Next-generation capabilities will only increase this bandwidth.

The new wave of AI will have significant, far-reaching effects for almost everyone. In terms of its general use cases in the day to day, per the Guardian, How ChatGPT Will Destabilize White-Collar Work[14]:

> The upside of these AI tools is easy to see: They're going to produce a tremendous amount of digital content, quickly and cheaply. Students are already using ChatGPT to help them write essays. Businesses are using ChatGPT to create copy for their websites and promotional materials, and to respond to customer-service inquiries. Lawyers are using it to produce legal briefs (ChatGPT passes the torts and evidence sections of the Multistate Bar Examination, by the way) and academics to produce footnotes.



For over a decade, Amazon's Kiva robots (pictured here bringing a pallet of products to a warehouse order-fulfillment packager) have been central to their competitive edge, with over 500,000 robots now in use.

Amazon's new Sparrow robot, revealed in 2022, uses computer vision and AI to adeptly pick some of the 13 million individual warehouse products that fulfillment packagers handle daily.

AI-driven robots are bringing additional warehouse efficiencies by loading and unloading delivery trucks and containers 24/7.

In early 2023 PepsiCo received Tesla's electric semi-trailer truck, which promises to lower carbon emissions, but raises concerns about the possible displacement of the country's 3.5 million truck drivers.

The Electric Sheep

Were Arthur C. Clarke a fan of Adam Smith's, one could imagine him positing that any sufficiently advanced technology would reduce human resources as a business expense. A March 2023 report by Goldman Sachs[15] claims two-thirds of jobs in the US and Europe are exposed to some degree of AI automation, and that around a quarter of current work could theoretically be performed by AI entirely. This ranges the gamut from fast food to financials. In every case, numerous notable and obvious benefits exist alongside potentially serious quagmires. For our purposes, let's dive into the implications for the financial industry and investing.

On the plus side, one of the key potential benefits of AI in our industry is its ability to analyze large amounts of data quickly and accurately, scanning millions of articles, financial reports, and social-media posts to identify patterns humans might miss. This can help investment professionals make better-informed decisions about which stocks to buy and sell, and which companies to keep tracking.

In this way, AI is more likely to supplement rather than supplant human analysts (as was the case with the introduction of spreadsheets). While such advanced algorithms can provide valuable insights and help analysts work more efficiently, human judgment is essential to successful investing, especially in terms of value alignment. Inputs focused on mission, hard and soft objectives, and financial returns can only go so far in tracking companies and opportunities that seem to align, with the human touch providing the alchemical ingredient revealing the truth behind appearances. As this technology continues to evolve, investment professionals at all levels will need to adapt and develop new skills to stay competitive and differentiate themselves.

Harnessing such exciting advancements also demands that we understand the limitations. Importantly, AI can amplify our penchant for bias. AI-powered investment tools are only as unbiased as the data on which they're trained[16]. This can lead to an insidious feedback loop if such data in any way disproportionately reflects any particular agenda, with the continued, and seemingly scientifically sanctioned, unfair treatment of certain individuals or groups, particularly in areas such as lending, insurance, venture backing, and asset management.

In terms of the seeming authority of such technology, the lack of transparency, also known as the "black box" problem, makes it difficult to understand how an AI model arrived at a particular decision. Without an understanding of the reasoning or chain of thought, the connection between the inputs and output are effectively lost beyond what seems obvious, but when investing large sums of money for organizations and communities whose survival may depend on the outcome, nothing obvious should be taken for granted.

As capital allocators, our interest lies in harnessing these tools to improve our work while deploying capital in a manner able to capture the positive financial outcomes that always accompany radical shifts. For example, within the overly restrictive parameters of a traditional investment style framework, innovation and change may be assumed as solely the province of growth investors, yet this is not always the case. While growth managers may be willing to look forward and assume greater medium-term risk in anticipation of commercial impact, many value investors would not consider an optically inexpensive stock truly inexpensive if the business is open to major disruption or potential deterioration at various points; as AI constantly iterates to the next stage, viability beyond immediate interest becomes a constant concern. The far-reaching implications of such applications will have both positive and negative effects on many businesses at various stages. Value investors cannot and should not ignore this change.

That said, the approach to tackling such technology from an investment standpoint shouldn't be fundamentally differentiated from the approach taken with any new opportunity. Importantly, especially for AI, understanding the potential regulatory and control side of things—which at its core involves applying the latter two environmental, social, and governance (ESG) principles—is as key to uncovering the best options moving forward as identifying the next best iteration of the technology. For example, applying an ESG lens to the abovementioned issues of bias and transparency can help ensure a new offering or product is poised for continued success. For the former, it's important to ensure AI models are trained on diverse and representative data that reflects the populations they are intended to serve; for the latter, models should be able to demonstrate clear explanations of their decision-making processes, which has implications from impact to accounting concerns.

This juxtaposition of pervasive social impact and complexity brings the issue of a strong risk framework in investment strategies front and center. Our firm's soon-to-be-released ESG assessment system adds to a large toolkit and capitalizes on the power of curated data to help uncover vulnerabilities. One day, we expect AI modeling to comprise a core element of systems such as ours, perhaps somewhat ironically leveraged to help interrogate the principles, impact, and concerns underlying such systems.

Originally developed by NASA for use in zero gravity, engineers at Amazon are using microspine-gripper technology in conjunction with machine learning to teach their warehouse bots how to handle individual products with a degree of dexterity still largely the domain of human hands.

This is not to say that the human element isn't of paramount importance. At Crewcial, we are able to tap into a wide network of investors—spanning the earliest stages of high growth venture-capital investing to more traditional value strategies—to acquire a deeper understanding of various potential trajectories, such as asking each firm if and how they integrate AI into their research process and company assessment. Such information is both useful in isolation and across the hundreds of discussions that serve as a basis for comparison.

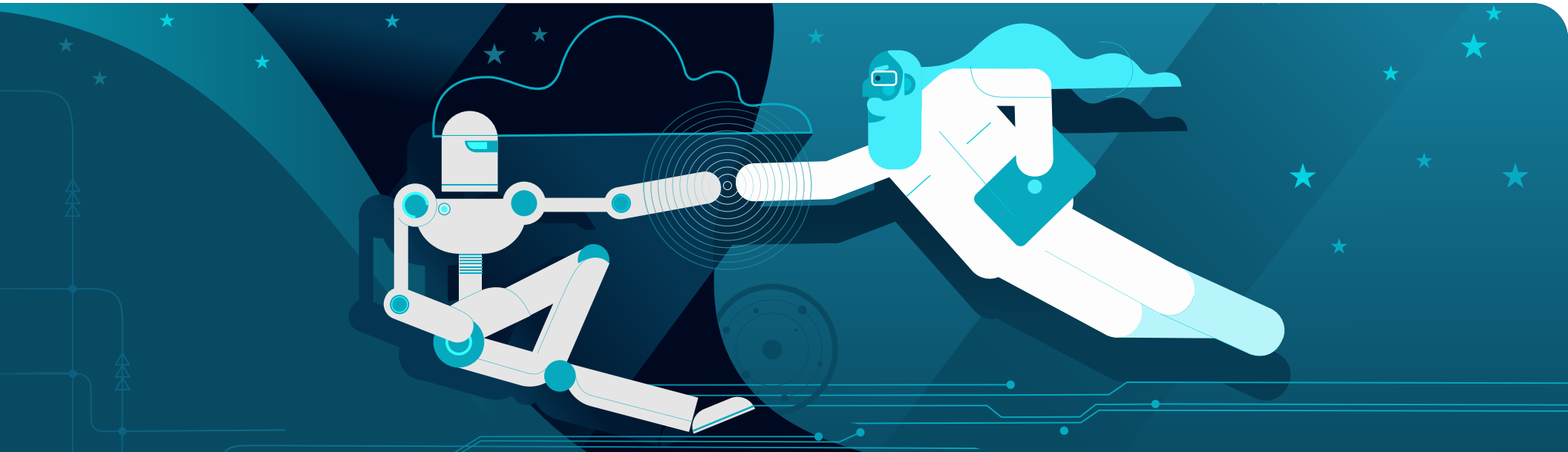
Despite the paradigm-shifting implications of AI, it is still a tool leveraged by humans towards human ends. We may yet reach a sci-fi predicted singularity or find ourselves facing down a fully intelligent robot army with its own motivations and value system at odds with our own. However, for the time being, such tools are fundamentally well-curated search engines and quick, complex calculators amalgamating all-too-human knowledge in a manner more readily interpretable to a broader range of people than before. Even the next iterations and aims concern advancements on existing needs and wants.

This leads us back to some basic investment principles for successfully fording these new wakes. As with any new technology, the best managers will be focused on...

1. Identifying chances to capitalize on the continued growth of top-tier companies in the industries and sectors best positioned to assimilate the tech and expand their competitive moats.

2. Finding the new entrants best positioned to unseat dominant firms from their current perch. In terms of the opportunities afforded by displacement, it would also be prudent to look at the players designing and implementing transitional paths for those most affected.

Ultimately, to borrow the rhetoric of Star Trek's notorious Borg army, resistance is futile. The extent to which individuals, companies, and even governments thrive moving forward depends entirely upon how each chooses to help nurture and regulate humanity's insatiable drive to synthesize its own intelligence. The best-performing investors will be those that anticipate the best uses, potential shortcomings, and Nth-degree effects of any such applications.



The Morning After

In the words of Johnstone Professor of Psychology, Harvard University, Steven Pinker, "There is no omniscient and omnipotent wonder algorithm: There are as many intelligences as there are goals and worlds.[17]" In the production of a truly original thought, imitation will never be synonymous with innovation.

Going forward, human intelligence will be of paramount importance in developing, applying, interpreting, and circumscribing increasingly complex AI systems, which should be made transparent, explainable, and aligned with human values.

One thing is certain, AI is here to stay; some of the research for this piece was gathered with AI assistance, leveraged by humans capable of discerning among the information provided and understanding the all-too-important context between the lines. The future will look different with AI. However, so long as these systems are employed responsibly, thoughtfully, and transparently as tools, with an awareness of both their potential and all-too-real limitations—fortifying our shortcomings and better freeing us to exercise our own, authentically human intelligence—such AI-generated lines should act as rungs on a ladder towards a more accessible future, not the overwrought bars of a vaguely dystopic cage.

> **"THERE IS NO OMNISCIENT AND OMNIPOTENT WONDER ALGORITHM: THERE ARE AS MANY INTELLIGENCES AS THERE ARE GOALS AND WORLDS."**

Endnotes

1 https://www.metmuseum.org/exhibitions/listings/2014/assyria-to-iberia/blog/posts/phoenician-sailing
2 https://www.forbes.com/sites/greatspeculations/2016/05/18/heres-how-nike-is-innovating-to-scale-up-its-manufacturing/?sh=2ad2ad2c1497
3 https://www.aboutamazon.com/news/operations/10-years-of-amazon-robotics-how-robots-help-sort-packages-move-product-and-improve-safety
4 It is worth noting over 1000 languages are spoken globally.
5 https://chat.openai.com/chat?model=gpt-4
6 https://www.youtube.com/watch?v=Asg1e_IYzR8
7 https://www.unite.ai/best-ai-video-generators/
8 https://medium.com/@blinx/artificial-intelligence-behind-avatar-the-way-of-water-9c0ad13875a6
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