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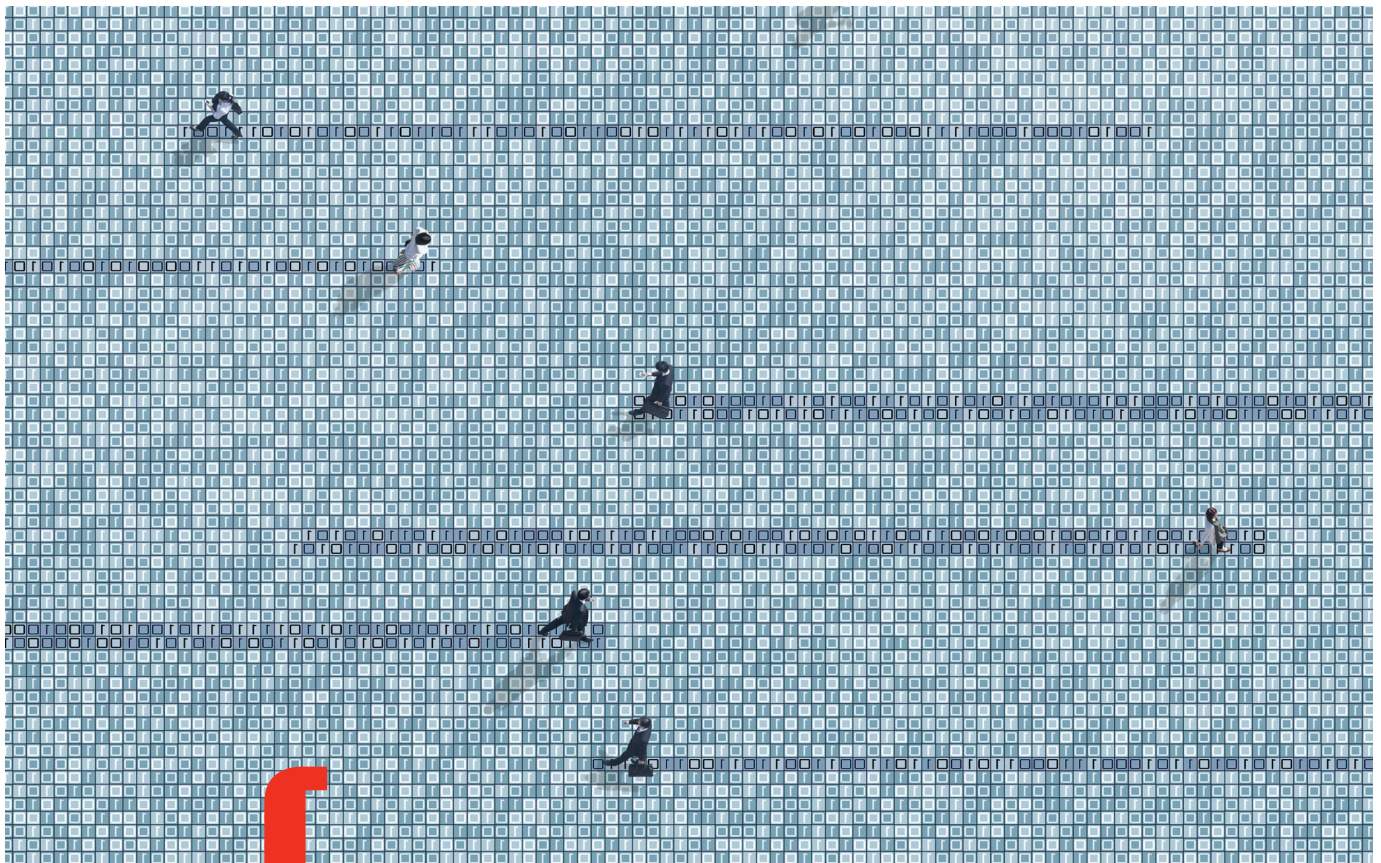
For **business leaders who crack the code**, the results can be breath-taking.

BY **SAM GREENGARD**

Although AI is not new, machine learning and deep learning play an increasingly prominent role in diverse areas, including autonomous robotics, medical diagnostics, natural speech, machine vision and cybersecurity.

very advance in digital technology introduces an opportunity to leap ahead of competitors. When business leaders get the formula right, the results can be breathtaking. Productivity grows, costs drop and innovation ensues. In a best-case scenario, the outcome can disrupt an entire industry or marketplace.

Nowhere is this fact more apparent than with artificial intelligence (AI). Although AI isn't new—it has been around in one form or another for decades—the technology and its subsets machine learning (ML) and deep learning (DL) play an increasingly prominent role in diverse areas, including autonomous robotics, medical diagnostics, natural speech, machine vision, digital twins and cybersecurity, to name a few.

What's more, an entirely new and more powerful generation of AI is rapidly taking shape. Advances in computing power, cloud frameworks and software are introducing possibilities and capabilities that were beyond the horizon only a few years ago. For example, it's now possible to board a plane with only a face scan, buy custom-designed clothing through an interactive app on a smartphone and use a chatbot to answer a question or resolve a problem.

Today, AI is at the center of strategic growth for businesses large and small. Andrew Ng, a computer scientist and thought leader in the field of AI, has stated, "It is difficult to think of a major industry that AI will not transform. This includes health care, education, transportation, retail, communications and agriculture. There are surprisingly clear paths for AI to make a big difference in all of these industries."

AI Means Business

AI's imprint on society is increasingly apparent. It has fundamentally changed the way people interact and transact in both physical and virtual spaces. It makes it possible to use real-time navigation, ride-sharing and delivery services. It has altered the way engineers design high-rise buildings, roads and bridges. Meanwhile, airlines use AI to manage enormous fleets of aircraft and adapt to mechanical and weather-related issues in real time.

Nearly every corner of the modern enterprise is touched by AI, and many of the largest organizations utilize it for a variety of needs. For instance, Alphabet recently acquired Deep Mind, an AI firm whose programs have learned to diagnose eye diseases as effectively as the world's top doctors, as well as to save 30% of the energy used to keep Google's data centers cool, and to predict the complex 3D shapes of proteins—which could one day transform the way drugs are invented.

Additionally, Microsoft is integrating AI into all of its products and services, including Cortana, Skype, Bing and Office 365, and is one of the world's biggest AI as a Service (AIaaS) vendors.

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The ability to sort through mountains of data and then act on it with little or no human intervention is nothing less than disruptive. Yet today's AI extends far beyond putting data to work in new and useful ways and simply automating machines and systems. AI can increasingly "perceive" and "think" on par with humans, and also handle tasks that lie outside the scope of human ability—such as spotting imperceptible manufacturing flaws through computer vision or managing a city's entire network of traffic lights to improve traffic flow.

No technology represents AI better than digital twins. These virtual systems, which create realistic computer models of real-world products—everything from wind turbines to jet engines—are an order of magnitude more advanced than computer simulations. They can use data streaming in from connected sensors and other sources to generate an

even smart cities. AI does not only combine these technologies for incremental gain; it unleashes new and potentially radical capabilities. As Microsoft CEO Satya Nadella puts it, AI is the "defining technology of our times."

Weighing AI Risks and Rewards

Business leaders increasingly recognize the power of AI to reinvent the enterprise. A 2019 survey of more than 2,500 executives conducted by *MIT Sloan Management Review* and Boston Consulting found that 90% of respondents view AI as a business opportunity for their company. Yet the news is not all positive. It also found that 70% of firms report minimal or no impact from AI, and 40% of the organizations making significant investments in AI are not reporting business gains from it.

Indeed, harnessing the technology for long-term business growth remains a challenging

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actual virtual replica—or twin—of a physical device. AI can then analyze the data, physical attributes, weather, temperature, energy output, vibration and countless other factors, and deliver deep insights into performance, maintenance and failure.

In fact, AI is at the center of the Fourth Industrial Revolution—aka Industry 4.0. It ties digital technologies such as robotics, analytics, nanotechnology, quantum computing, wearables, the Internet of Things (IoT), additive manufacturing (3D printing) and advanced materials science to enable the creation of smart factories, smart business networks and

proposition, tech research and consulting firm Gartner notes. Many organizations aren't moving fast enough. It predicts only 50% of enterprises will have devised AI orchestration platforms to operationalize the technology by 2025—up from less than 10% in 2020. The difficulties are in several areas, including developing a strategy, attracting and retaining data scientists and business analysts who grasp the technology, and building out an IT framework to fully support AI. In fact, Gartner predicts that as AI and digital technologies mature and coalesce, there will be tenfold growth in >>>

computing requirements.

MIT Sloan identified a common refrain: "What if competitors, particularly unencumbered new entrants, figure out AI before we do?" In 2019, 45% of survey respondents perceived some risk from AI, up from an already substantial 37% in 2017. "While some companies have clearly figured out how to be successful, most companies have a hard time generating value with AI," it reported. The takeaway? "AI is a source of untapped opportunity, it is an existential risk, and it is difficult."

Businesses also face growing public concerns about the use of AI. These include AI ethics and data privacy, which touch numerous areas, including the use and misuse of facial recognition, listening in on voice data collected through personal assistants and

Building a Smarter Enterprise

Successful AI initiatives require a highly focused strategic plan as well as a robust information technology framework to support various initiatives. The first steps for CEOs, CIOs, CTOs and other enterprise leaders is to familiarize themselves with AI, invest in projects, and test them in new and creative ways. As an organization learns and adapts, it will begin to spot opportunities large and small. Over time, these insights can lead to productivity gains, cost efficiencies, and new products, services, apps and markets.

Typically, this AI development framework translates into a need for a more agile, creative and entrepreneurial approach to business. There may be a need for quasi-independent incubators and innovation labs that spawn and test concepts, new types of business partnerships or strategic acquisitions.

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smart speakers, autonomous decision-making in robots and other devices, and cognitive systems that can read human emotions and react in a manipulative way—using speech or adapting content. Concerns about AI bias and the explainability of algorithms, particularly those used for making financial and security decisions, are also growing.

These are not issues that business leaders can brush aside in the quest to monetize artificial intelligence. If AI is to realize its full potential, "increased trust, transparency, fairness and auditability" are essential, notes Svetlana Sicular, a research vice president at Gartner.

Regardless of the specific approach, there is a need to coordinate AI development and deployment efforts across business units, groups and teams.

AI typically requires agile and scalable cloud platforms that deliver computing power, networking infrastructure, storage resources and software tools that are essential for AI development. This typically takes the form of Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS) offerings that contain highly portable and compatible components, such as containers that work across vendors and tools. These elements are critical because they allow an enterprise to

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operate in faster and more flexible ways while accommodating enormous volumes of data.

Clouds also serve as a nexus for various digital technologies that are essential to AI, such as the Internet of Things and various forms of data, including images, voice and text. As all this data streams in, computing resources such as CPUs and GPUs conduct machine learning (systems typically trained by humans) and deep learning (systems that operate independent of human intervention). The resulting algorithms—which may change based on new data—convert the promise of AI into a tangible reality.

AI Leaps Forward

When businesses combine the pieces of the AI puzzle correctly, the results can be transformative. AI can remap a customer journey and help a business know when it is the right moment to market and promote products. It can introduce a far more personalized experience on a webpage or within an app. It can also combine technologies in new ways, such as translating language in real time or identifying an object—anything from the words on a restaurant menu to a machine part— simply by allowing users to point a smartphone at the object and view an augmented overlay of text or an image on the screen.

To be sure, companies looking to gain the greatest benefit from AI are fundamentally rewiring the way they do business. They are looking to move beyond simple cost-cutting and incremental improvements and redefine the way data, information and objects act, react and interact. Their leaders understand that AI unlocks a door to innovation, disruption and growth on a scale that has never before been possible. **IQ**

The Modern Prometheus?

Did a Google chatbot achieve sentience? Experts weigh in.

In 2021, former Google researcher Blake Lemoine ignited a controversy when he claimed that an AI system called LaMDA was sentient. This implies that the system could actually think and feel.

Linguistics experts pointed out that the ability to generate realistic speech may seem like sentience, but it is really just an ability to parrot human communication very well. "These systems have no idea what they are talking about," says **Marjorie McShane**, a professor of cognitive science at Rensselaer Polytechnic Institute.

Stanford University researcher **John Etchemendy**, co-director of the Stanford Institute for Human-Centered AI (HAI) noted: "LaMDA is not sentient for the simple reason that it does not have the physiology to have sensations and feelings."

A more relevant question is: What value do AI systems have for the business world, particularly those that use computational linguistics and natural speech?

For now, the likes of Siri and Alexa serve as personal assistants that can handle basic tasks, such as conducting a Google search or ordering an item from Amazon. Speech interfaces also control functions in automobiles and in online chatbots that deliver customer support.

While today's natural-language AI is certainly impressive, it is merely a glimpse of what is to come.

AI: The Next Generation

In the future, as computational linguistics advances, systems that can communicate on human terms could address more than basic tasks like asking Siri to find a Thai restaurant or dial home. In fact, questioning whether AI systems display sentience is almost certainly missing the point. **IQ**