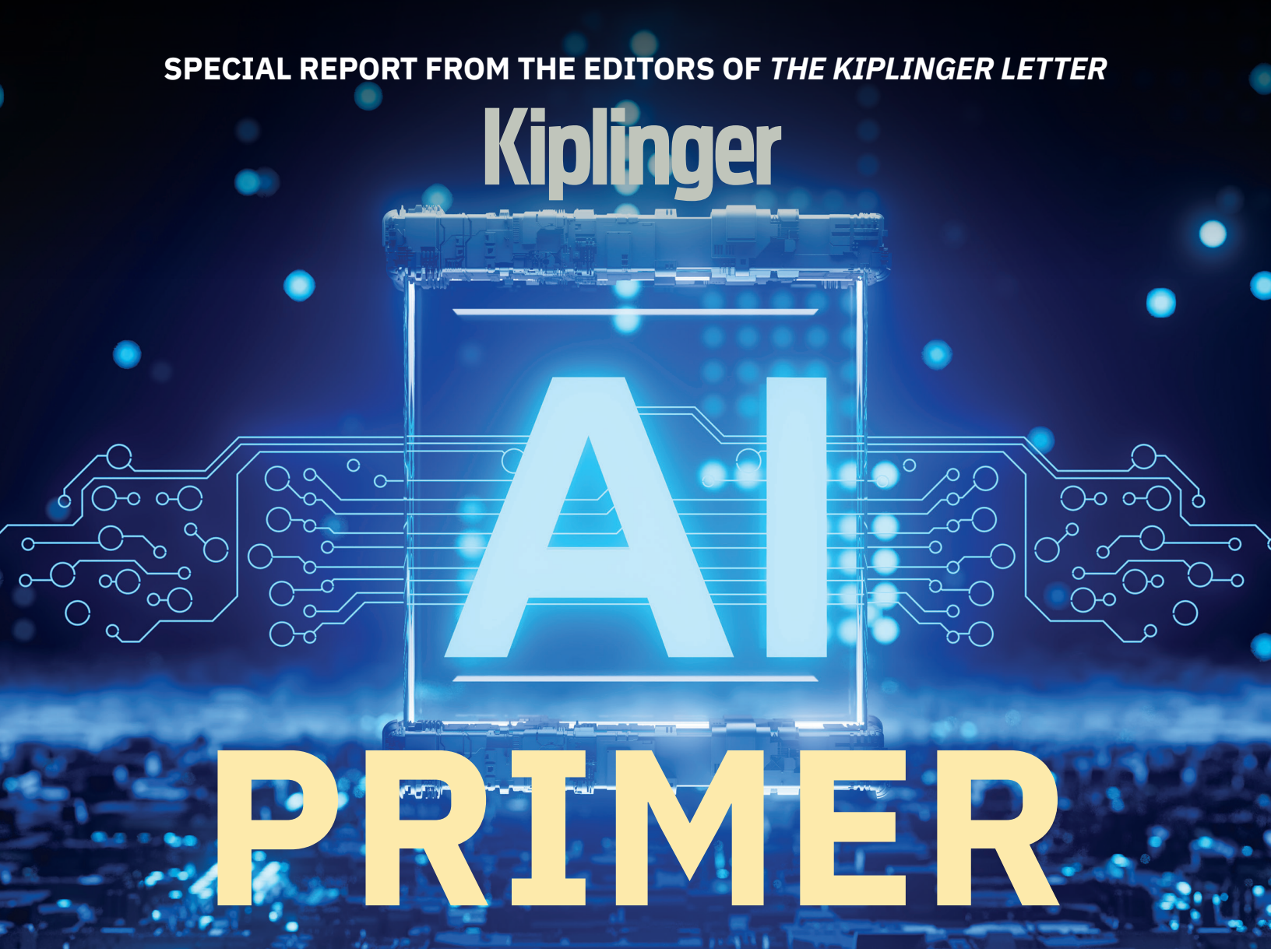
SPECIAL REPORT FROM THE EDITORS OF *THE KIPLINGER LETTER*

Kiplinger

AI PRIMER



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Amazing Uses of AI Are Taking Hold

A TECH BREAKTHROUGH

Generative artificial intelligence marks a major tech breakthrough. It's AI that we can talk to in plain English and that is capable of remarkably humanlike responses. Beyond generating text, users of generative AI can create charts, images, audio, videos and more by giving the AI tool simple text instructions. Users don't need any technical know-how to start, so the tech is universally accessible. And it's generalized AI that works across a seemingly endless range of tasks and fields of knowledge.

Those qualities have led to rapid adoption and uninhibited excitement. This new AI age will play out over the next decade, but this report highlights some of the amazing uses that are emerging now.

ASTRONONOMICAL AI SPENDING

Big Tech firms plan massive AI spending this year. Alphabet, Amazon, Meta and Microsoft will spend over $300 billion combined in capital expenditures this year, mostly for Nvidia-powered AI servers in huge data centers. Each Nvidia chip costs about $30,000 to $40,000. Spending on servers will surge again in 2025, though a bit slower than 2024's pace. Businesses are budgeting for generative AI, both hardware like AI-enabled PCs and smartphones, and AI software, to boost productivity and cut costs. The biggest spenders include banks, software sellers and retailers searching for specific AI uses that pay off.

AI CHIPS SOAR

Nvidia data center revenue ($B)

2020	3
2021	7
2022	11
2023	15
2024	47
2025	115
2026	163
2027	198
2028	225

SOURCE: Morningstar

Among the companies building leading AI models: OpenAI, Anthropic, Meta, Google, Mistral AI, Cohere, Amazon, xAI and Stability AI. It costs hundreds of millions of dollars to get AI models to work, a process known as training, and takes months of constant data center computation on hundreds of billions of words or other data. That cost will go into the billions with an ever-growing

demand for computing power.

CHEAPER AI IS COMING

The splashy release of China's DeepSeek AI model show's China's ability to innovate, but it likely piggybacks on U.S. research that cost billions of dollars, and includes other hefty spending unstated by DeepSeek. Tech giants won't pull back spending much this year, but could do so later as Amazon, Meta, Microsoft and Google grapple with AI's return on investment.

Cutting-edge AI will continue to be costly, needing lots of Nvidia AI chips and huge data centers, not just to train AI models but also to run lots of new AI apps. Expect the U.S. to pursue new AI restrictions and export controls on China. However, DeepSeek is open-source software and freely available, making it hard to stop. Meta is also giving away its AI models for free. Its open-sourced Llama AI models are seeing rapid adoption and are used by major companies, including AT&T, DoorDash, Goldman Sachs, Nian-tic, Shopify, Spotify and Zoom. Meanwhile, other major AI vendors are finding ways to lower the cost to customers.

The heated competition and open-source models show how cheaper AI is coming, which is good for faster AI adoption and economic growth.

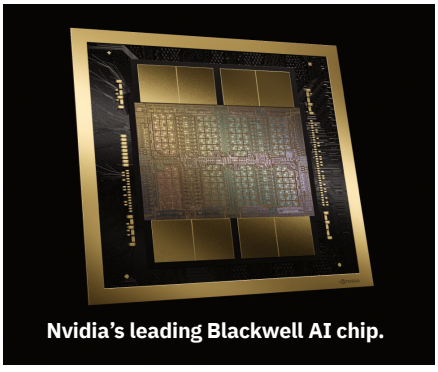
THE UNDERLYING TECH

Generative AI stems from huge amounts of data and computing power, using the brute force of graphics processing units (GPUs) on a mountain of internet and other data. The AI systems are known as large language models that learn patterns in language to predict the next word, enabling remarkably complex and humanlike responses. The inner workings of these digital neural networks are not fully understood. Flaws, such as errors and unreliability, are still common. But expect steady improvements.

HOW AI IMPACTS THE ECONOMY

By next year, more money will be spent globally on software with generative AI than on software without it, according to Gartner, a technology market research company. The shift shows how fast AI is going mainstream.

Artificial intelligence has the potential to be this decade's internet: A huge technical advance that makes workers far more productive and lifts the economy's speed limit. While there is undoubtedly lots of hype about AI and how it's going to transform everything, it does look like a candidate for enabling genuine, far-reaching efficiency gains across many jobs and sectors. It'll take time to play out. Remember, the revolution in digital computing took about half a century from the earliest machines to widespread consumer use.



Nvidia's leading Blackwell AI chip.

COURTESY OF NVIDIA

But AI is already ramping up business spending on AI-specific chips for servers and personal devices, as tech companies rush to prepare for a flood of future AI applications. Purchases of the graphical processing units and other gear needed to run AI programs could push up growth in the country's capital stock (i.e., its combined productive assets, from factories to server farms). Today, growth in capital stock is running at about 2% per year. By decade's end, it could hit 3%. More and better capital equipment doesn't guarantee greater worker productivity. But it is generally a precursor that enables firms to get more done per employee.

Hype aside, there are already early signs of how AI will boost efficiency. One recent study found that software writers who used AI to help write code got an assignment done 56% faster than counterparts doing all the work themselves. Another showed that admin workers using ChatGPT spent 40% less time on a task. A customer support firm got customer issues resolved 14% faster with AI assistants.

These initial anecdotes could be the first harbingers of widespread gains to come.

2024 BY THE NUMBERS

$109 billion
Private AI investment in the U.S.

$34 billion
Global private investment in generative AI

71%
Organizations reported using generative AI

2,049
Newly funded AI companies

59
AI regulations introduced in the U.S.

$5.2 billion
U.S. federal public spending on AI-related contracts

SOURCE: The AI Index 2025 Annual Report by Stanford University

THE EXPLOSION OF NEW AI TOOLS

For an early sign of what's to come, look at top AI models that are emerging fast. The tools can create stunning virtual 3D worlds, lifelike voice assistants, Hollywood-like movies, full-length books and more.

Enjoy podcasts? Pick a topic and AI can create a lifelike conversational podcast based on text, internet research and other information. Google's Genie model can create 3D video games, animations and prototypes by inputting simple text or images, such as "Show me a wizard walking through an ancient forest."

OpenAI, Google, Amazon and others are regularly releasing newly improved tools, from low-cost ones for mobile devices to expensive ones with high-end performance. Meta's top AI models are open-source, so they are freely available – a contrast with the others' proprietary efforts, spelling even more competition and choices.

The tech is quickly being embedded in everyday apps and services, including Microsoft 365's suite of word processing and other apps, web browsers and mobile operating systems from Apple and Android. The tools can write e-mails, summarize documents, edit photos, create presentations, answer questions, find e-mails, analyze data and more.

The trend is rapidly putting powerful AI features in the hands of millions of people. For example, Adobe Photoshop's Generative Fill lets users select a portion of an image to add anything, such as the perfect water drop on a flower. Microsoft's CoPilot lets users create slideshows by picking a template, providing a text outline and letting AI do the rest. Want to tweak a slide? Simply write a suggestion to Microsoft's AI chatbot. AI is also becoming prevalent in software for analytics, customer relationship tools and supply chain systems.

Other software vendors starting to make money on generative AI tools include Salesforce, ServiceNow, Hubspot and Workday. Consulting firm Accenture has already booked $3 billion in AI sales.

Meanwhile, consumers are seeing AI seamlessly make its way into popular apps and websites, whether they want it or not. Facebook and Instagram users can tap Meta's AI chatbots to answer questions or generate images. Google's AI Overviews, its new AI search tool that provides detailed explanations to Google search queries, is rapidly gaining popularity.

The Holy Grail is autonomous AI assistants that can do complex work. These "agents" will take control of a computer to pull up documents and websites to book hotels, schedule meetings, do work research and more, completely on their own, while keeping the human in the loop. They'll call customer service for any issues, and AI may even talk to other AI. Assistants may become intimate virtual friends who understand tone and mood. And every worker could have a tireless assistant.

Salesforce is betting big on the tech, saying its updated AI agent is "enabling proactive AI agents to work behind the scenes, without constant human oversight." The tools automatically answer customer questions and book meetings for sales reps.

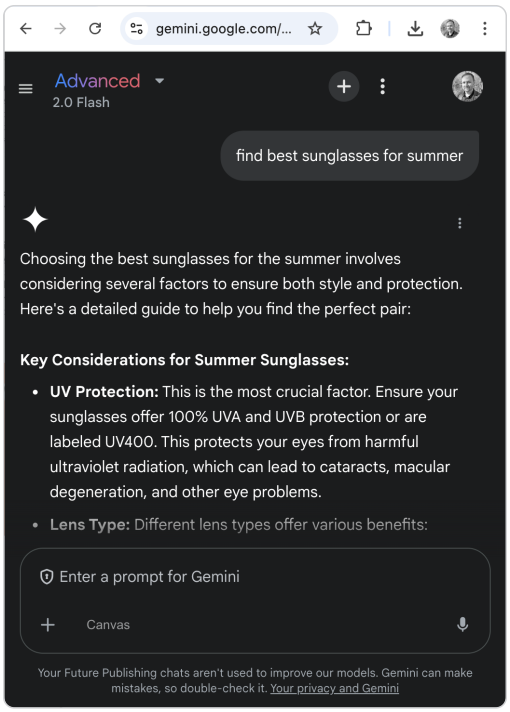
TOP AI USE CASES IN 2024

Code copilots:	Develop, edit and test software
Support chatbots:	AI chatbots for employees and customers
Enterprise search:	Internal company search for employees
Data extraction:	Retrieving data from multiple sources
Meeting summarization:	Automatic notetaking and bullet points for meetings

(SOURCE: "2024: The State of Generative AI in the Enterprise," Menlo Ventures)

COURTESY OF ADOBE

THREE NEW USES FOR AI



A SKILLED RESEARCHER

Keep an eye on this emerging AI use case: Churning out in-depth reports. An investor can create a competitive analysis of the retail industry, or a consumer can ask for a report on the best dishwasher. OpenAI's tool, dubbed Deep Research, can finish the research in five to 30 minutes. Early users are very impressed with the detailed research, which includes source lists, and resembles something an entry-level worker would write. Microsoft recently added a similar feature to its CoPilot tool, claiming the AI feature could shave hours off the time it would normally take to complete.

However, the results often rely on what's publicly available on the internet. That won't suffice for many professionals. Lots of market research, medical studies, journalism and other published materials are paywalled or unavailable on the web. To remedy that, AI companies will have to strike more licensing deals: no easy feat. Note that users can upload data, PDF reports or other text to augment the results.

A SHOPPING ASSISTANT

In a bid to lure paying customers, AI start-ups are turning to shopping. Generative AI search engine Perplexity has unveiled a shopping assistant for customers that pay $20 per month for the start-up's pro subscription. The tool lets users take a photo of an item or be specific about what they want to get results. For example, type "I want to design a cozy at-home office" or "I want to buy a gift under $50 for someone picky." Rather than just links to relevant web pages, the answers include detailed descriptions of products, prices and where to buy.

There's also advice on how to find deals and a place to ask follow-up questions. Perplexity touts that you can buy products with one click and that answers are precise and unsponsored. The start-up is also touting new tools for sellers. As with ads, online shopping will be a big way AI firms try to make money – two natural businesses for the web as AI firms look to recoup huge investments.

A HOUSEHOLD ASSISTANT

Have a lengthy to-do list? New AI household assistants can handle chores in the background by using AI connected to your mobile apps. Ohai can find a recipe, make a grocery list and even get food delivered. For Christmas, it can pick out a holiday card, upload a photo and send the cards to your contact list. Goldee scans kid-related emails to populate your digital calendars with reminders, so you don't miss key dates in school newsletters. Ollie can help buy gifts for friends, giving recommendations based on age, gender and interests.

The tools learn as they go based on user responses and the information you make available, such as emails. Marketing will especially target working moms with young kids, likely a big market. Many already-popular calendar tools will feature similar, built-in AI features, too.

GETTY IMAGES (LEFT); COURTESY OF GOOGLE (ABOVE)

HOW AI IS CHANGING THE RETAIL INDUSTRY

Given all the hype over artificial intelligence, how are businesses saving on labor costs, boosting sales and finding other benefits? Retail is a good industry to examine, since it's proving to be fertile ground for AI.

Here are some real-world retail examples to show what's possible and what is on the horizon.

Summarizing product reviews on Amazon. The e-commerce giant is using artificial intelligence to summarize thousands of reviews from customers so that prospective buyers can quickly get a sense of other people's experience with a given product. The short paragraph highlights product features and the most common customer sentiment.

Updating product descriptions. If the current product description doesn't match up with what customers use in their searches, Amazon can use AI to automatically modify the description. Result: More people find, and buy, what they want. E-commerce platform Shopify provides a tool to generate product descriptions in seconds based on keywords and other special instructions.

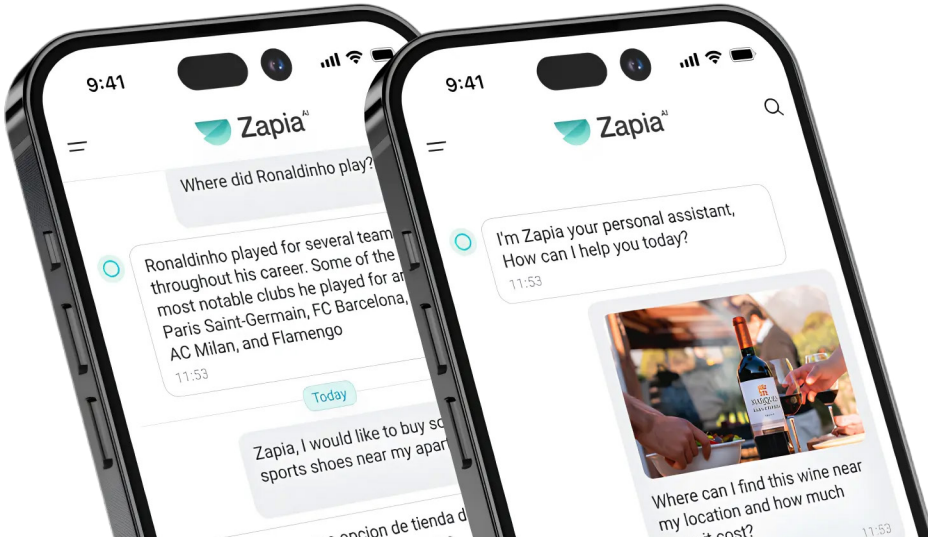
Tailoring recommendations to customers. One recent survey shows that 60% of Gen Zers would be comfortable using AI-assisted shopping. For instance, when buying clothes or shoes, an AI app can recommend what size to buy based on prior purchases. That reduces expensive returns, a common problem with apparel bought online.

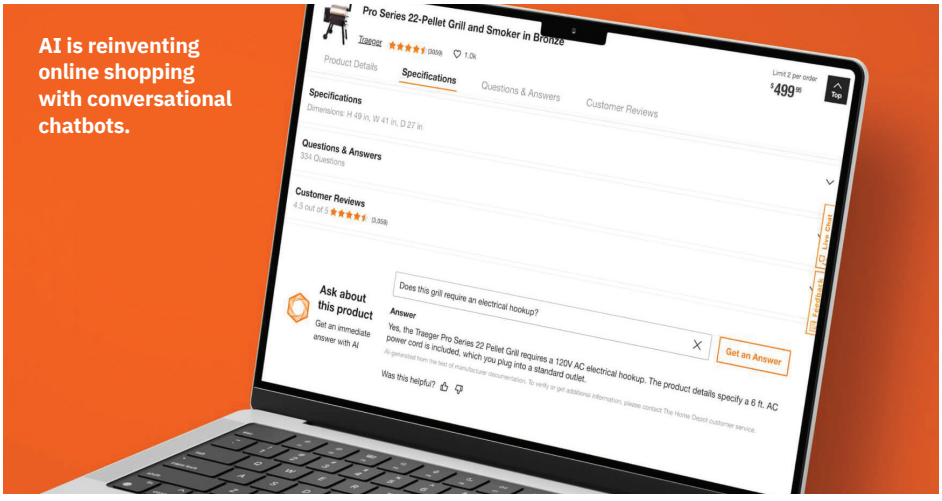
Detecting fraudulent purchases. By recognizing suspicious buying patterns like repeat orders of expensive items, AI can stop potential criminals. Workers handling manual fraud reviews can now harness AI chatbots to help answer questions and speed up the process of pursuing potential cases. Also, AI tools can flag and remove fake product reviews.

Chatting with customers. Zapia, an AI assistant in use in Latin America, can talk to customers in English, Spanish and Brazilian Portuguese to help find products and ultimately make a purchase. There are AI wine chatbots that help customers choose wines based on personal preferences. Mattress seller Casper used Sierra's AI tech to design a chatbot that helped improve online sales. Home Depot's Magic Apron AI chatbot answers questions about tools and other products.

Enhancing in-store operations. For instance, Home Depot is using it to track how well-stocked shelves are and manage inventory. A mobile device used by workers uses AI computer vision to detect what products on shelves need restocking. Best Buy is using Google's Gemini AI tech to reschedule deliveries to stores.

Helping deal with complaints. AI can help human employees to more quickly record and process customer queries and complaints. It can also help with in-store sales by allowing store associates to recommend items a client may like based on prior purchases (though that will take careful compliance with privacy regs). For example, what pair of jeans would go well with a sweater you bought last month.





COURTESY OF HOME DEPOT (LEFT); COURTESY OF ZAPIA (ABOVE)

AI IN MEDICINE

THE AI DOCTOR COMING TO READ YOUR TEST RESULTS

There's big opportunity for AI tools that analyze CAT scans, MRIs and other medical images. But there are also big challenges that human clinicians and tech companies will have to overcome.

As generative artificial intelligence gets better at interpreting images, the tech industry is setting its sights on health care. Cue the AI radiologist.

The futuristic vision includes AI providing an accurate analysis of multiple medical scans, combining it with an understanding of patient history, and delivering a personalized diagnosis and course of treatment. When paired with a trained clinician, AI tools have the potential to improve the quality of care, save time and expand access to specialist expertise, among other benefits, according to a new paper, "Multimodal generative AI for medical image interpretation," in the medical journal *Nature*.

The authors say early research suggests that AI "could one day match human expert performance in generating reports across disciplines, such as radiology, pathology and dermatology."

Interpreting medical images and writing reports is a time-consuming challenge for human specialists. Risks include delays in getting results and human errors. Many current AI medical tools have narrow uses to find specific issues in a certain type of scan. A future AI model could have an expansive knowledge of multiple types of scans, all sorts of medical conditions and a range of treatments to recommend.

Tech giants and start-ups alike see huge moneymaking potential. Microsoft, Google and OpenAI all have AI models or research in medical imaging. Start-up Harrison.ai recently raised $112 million in funding to speed up diagnoses for radiologists, calling its widely used tool "a second set of eyes for clinicians." Microsoft is working with major hospitals on AI tools to interpret thousands of conditions, trying to tap into the tens of billions of dollars health systems spend annually on imaging and uncover cost savings.

But there are "formidable obstacles" to finding a truly helpful AI assistant in radiology, notes the paper. AI models have been plagued by biases, inaccuracies and so-called hallucinations, the industry term for made-up answers, including false or misleading text that sounds authoritative. Those types of flaws are nonstarters in a high-stakes medical setting unless there are strict guardrails.

One thing the researchers make clear: "Human evaluation is critical." AI tools for medical imaging need doctors to fine-tune them, and better benchmarks so they can be tested and improved. There need to be agreed-upon metrics to decide when and how to rely on AI.

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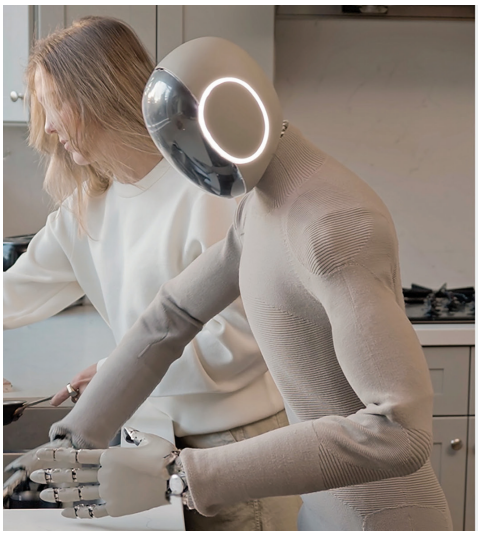
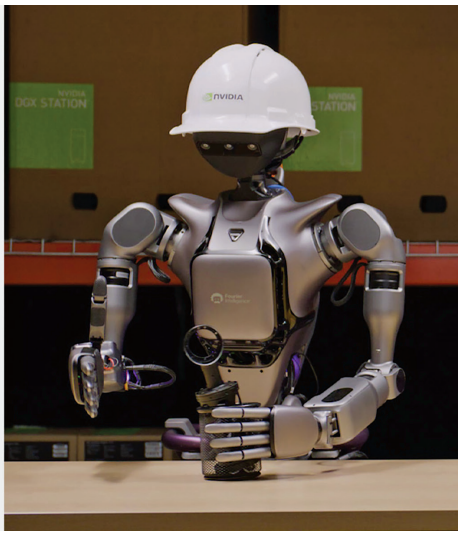
SCRUTINY IS COMING FOR AI IN MEDICINE

Expect artificial intelligence adoption by hospitals to get more scrutiny. AI tools now widely used to transcribe patient visits regularly fabricate text when the systems turn audio speech into written text. AI firms know about the issue, dubbed hallucinations, and the problem cuts across all applications of generative AI. There's been a push by medical centers to use OpenAI's underlying tech, Whisper, to save time, but researchers have consistently found hallucinations in transcripts.

A high-risk domain such as health care requires scrutiny of AI before widespread adoption occurs, say security experts. And OpenAI recommends that Whisper not be used in high-risk domains. Despite those warnings, adoption has surged, with 30,000 clinicians and 40 health systems using Whisper-based Nabla, according to the Associated Press. Doctors also use AI tools to send messages to patients.





LOOKING FOR NEW AI MARKETS

Nvidia is increasingly trying to drum up new business for years down the road, with new tech and strategic investments targeting areas such as robots, cars and health care. Finding new markets is an attempt to combat the inevitable slowdown of sales of its data center chips, a near certainty after recent years of explosive growth of AI data centers being built by tech giants.

A recent example: A partnership with health care companies IQVIA, Illumina and the Mayo Clinic to build AI models for drug discovery, genomic research and other health services. AMD, too, is targeting health care, with a new investment in Absci, a drug discovery firm.

Nvidia's AI model for robots aims to speed robot development and ultimately help combat global labor shortages. AMD, Intel and Qualcomm also have systems designed with robots in mind.

The potential of AI being unleashed in robotics has driven newfound excitement over humanoid robots. Hefty investment has poured into the tech to speed up commercialization. Hundreds of millions of dollars in venture capital have been invested in the robots in the last few years.

Companies working on cutting-edge robots include Boston Dynamics, Figure and Agility. Tesla made a splash with its effort. Other notable firms: Apptronik, 1X Technologies, Sanctuary AI and Unitree Robotics. Agility's Digit, being tested in warehouses now to move boxes short distances, is 5'8", weighs 140 pounds and lifts up to 35 pounds.

However, humanoid robots have specific challenges that are not easy to overcome, including lackluster balance, lack of strength and speed, very high costs and short battery life. It's especially tricky to develop a robot that can work anywhere on a range of tasks.

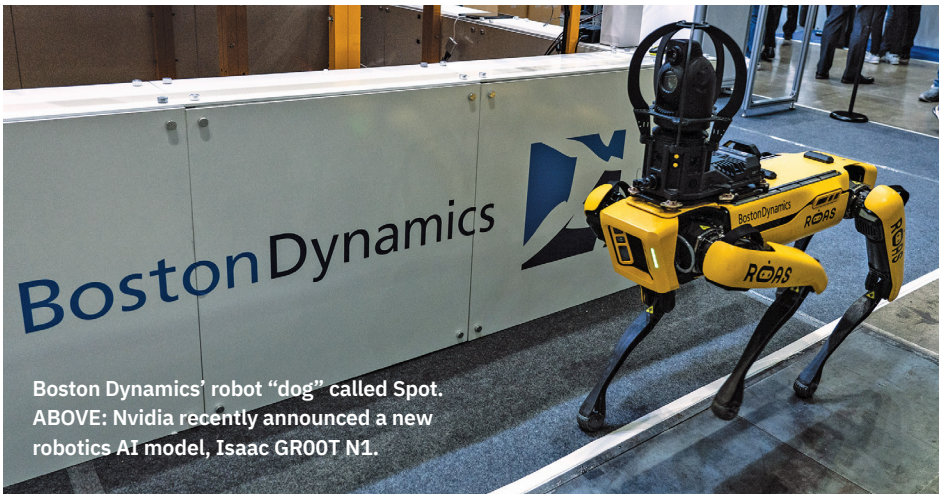
Expect exciting developments in coming years, but not much adoption over the next decade. The first uses in work settings are likely to be for repeatable and specific tasks. For example, taking a box from a shelf to a conveyor belt.

For example, much of the excitement for humanoid robots exceeds commercial reality. Despite promising tech, widespread use is a long way off.

Meanwhile, the four Big Tech companies spending hundreds of billions of dollars on AI are racing to find new markets and show moneymaking potential. Direct revenue will remain hard to come by, but any positive signs will be loudly touted to investors.

Getting consumers and businesses to fork over extra money for premium AI services won't be easy. Microsoft and Alphabet are charging for their AI tools, trying to figure out how much users are willing to pay. Meta highlights how AI is improving ads on Facebook and Instagram, thus scoring profits. Amazon touts how it improves its e-commerce platform while also highlighting paying users of its AI cloud services.

With growing concerns that generative AI will take too long to pay off, pressure is building for real products and real profits.



Boston Dynamics' robot "dog" called Spot. ABOVE: Nvidia recently announced a new robotics AI model, Isaac GR00T N1.

GETTY IMAGES (LEFT); COURTESY OF NVIDIA (ABOVE)

CHALLENGES TO ADOPTING AI

BE WARY OF AI GURUS

There's a growing cottage industry of tips and tricks for using AI chatbots. But take such advice with a grain of salt. It's not clear what reliably works when using popular generative artificial intelligence tools such as OpenAI's ChatGPT. Prompts, which are the text that users write to ask questions and give context to AI chatbots, are still a bit of mystery. Suggestions have included being polite, such as writing "please" and "thanks," or informing the chatbot, "You are a very intelligent assistant."

But sometimes certain tricks work and sometimes they don't, says a new report by business school researchers studying generative AI at the University of Pennsylvania. The report tested AI models by asking different questions 100 times, finding that "AI results can often vary, even when asked the question." The lack of consistency is a lingering problem for AI users, including businesses, governments and other organizations.

It's clear that AI models need more rigorous testing to verify accuracy. For now, top experts often recommend that users experiment with questions and commands to uncover how to prompt the best results. That's little solace to customers, from lawyers to policy experts, that demand reliability and accuracy. If every answer needs to be thoroughly fact-checked, time-savings may disappear. However, AI is improving quickly and vendors are well aware of the issue.

LOOK BEFORE YOU LEAP

The deployment of AI brings both opportunity and risk for businesses. The companies that are fastest to harness productive uses will have an edge, including workers who figure out how to use AI creation tools to produce text, images, charts, computer code and more, or to better analyze data, images or written research.

But businesses rushing to use AI without a plan could lead to damaging missteps, ranging from wasted hours to security threats. AI is still far from perfect. It is still prone to plenty of errors, many of them inexplicable. These are tools that need human oversight and judgment. Cybersecurity and data breaches are issues. But the business benefits are multiplying.

Plenty of AI tools won't be fully baked and won't help productivity much at first. Companies need a clear plan and set of guidelines for generative AI before taking the plunge.

JOHN MILEY

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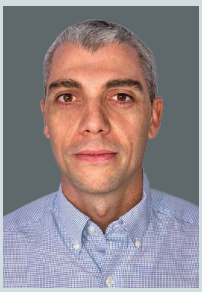

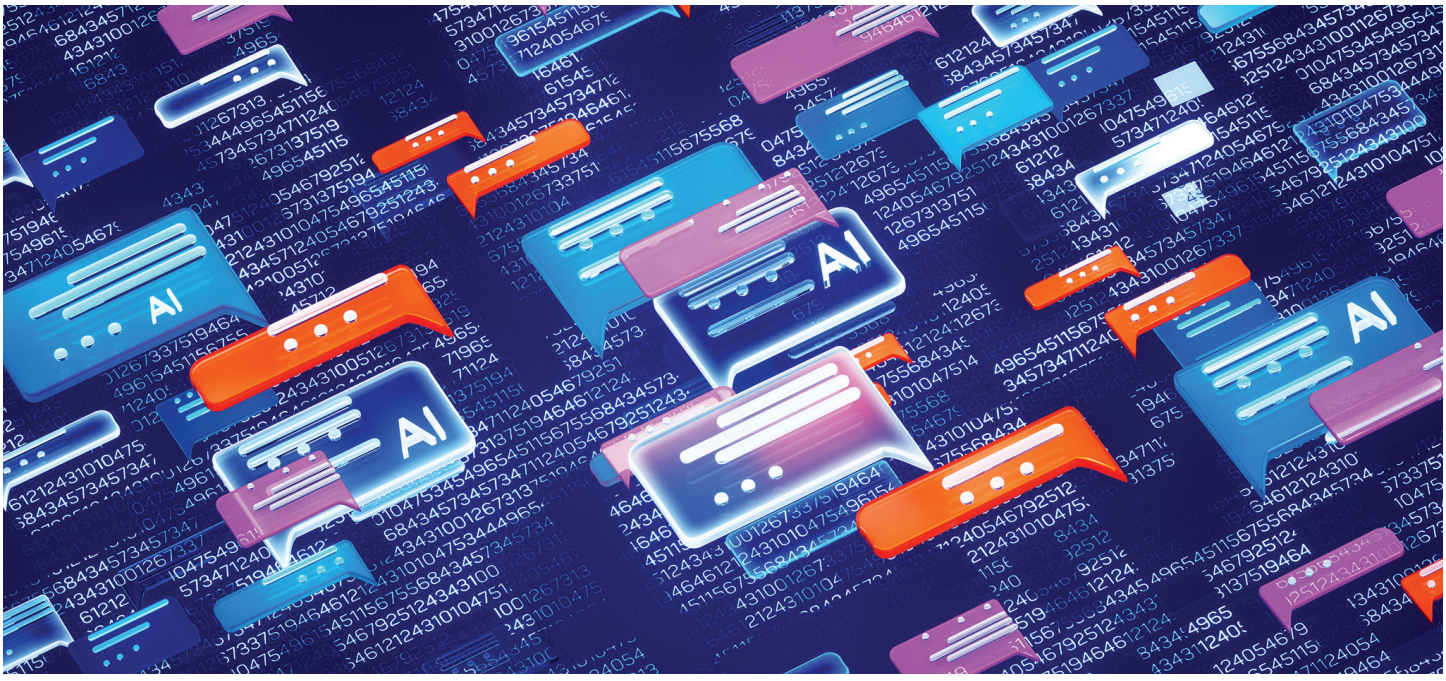

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