HPE GreenLake

How AI modeling and simulation accelerates new solutions to old problems

AI-powered simulations are transforming industries and society itself

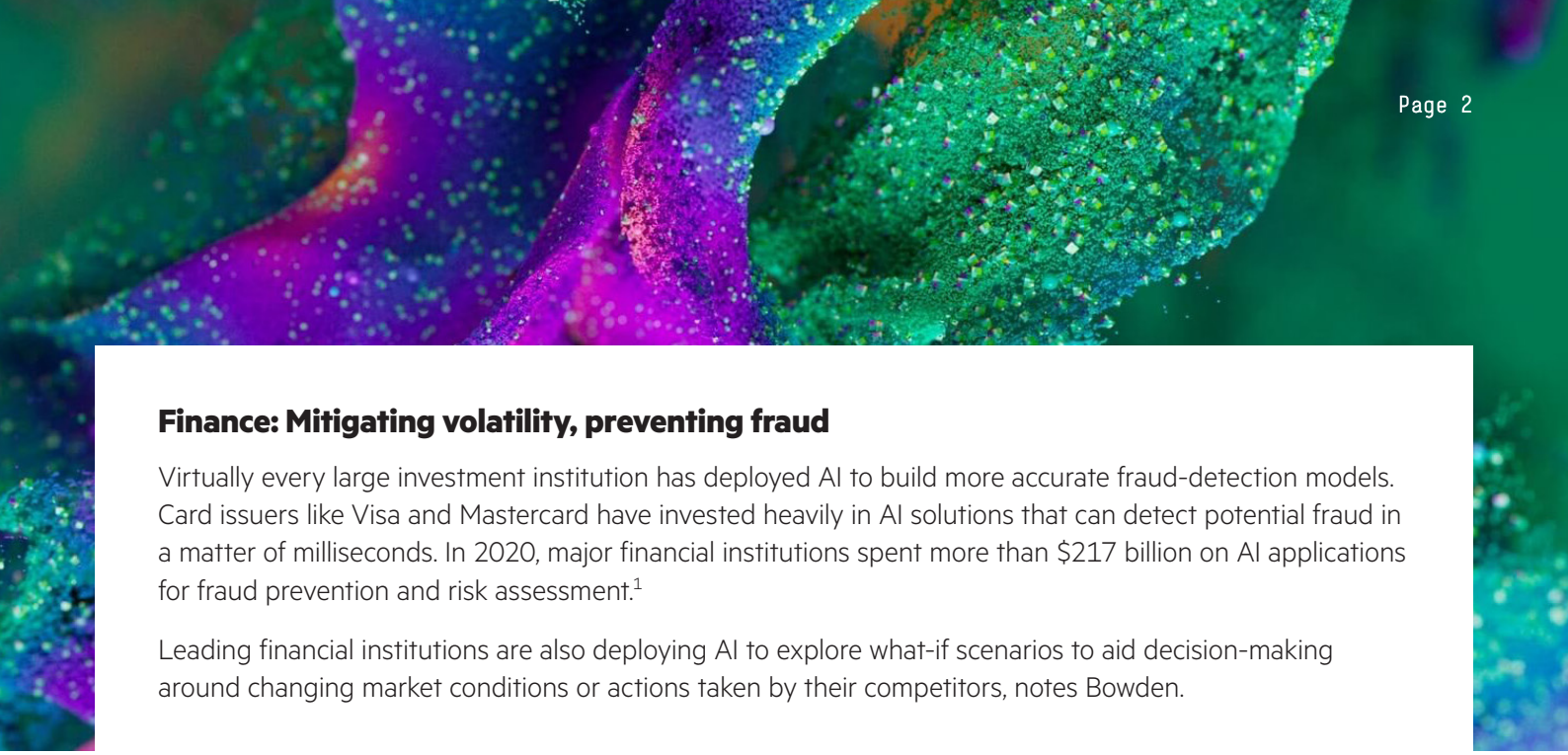
The tools available to tackle today's complex challenges are more powerful than ever. And one of the greatest tools in society's technology arsenal is artificial intelligence (AI) combined with traditional modeling and simulation. This convergence of AI with simulation expands our ability to run what-if scenarios that allow decision-makers to consider the impacts of a variety of potential actions.

Three things make this possible. One is the enormous amount of data being generated by our digital devices. Another is the vast amount of computing power now available to organizations. And the third is the huge gains made in the past few years in our ability to design and train AI models.

"High-performance computing is now the norm for many organizations and AI-enhanced simulations are some of the most useful ways to take advantage of all that processing power," notes Glyn Bowden, chief technologist for HPE GreenLake AI and Data Practice.

AI-enhanced simulations are already being employed to address the most pressing problems facing the world today. They're helping enterprises anticipate supply chain disruptions, aiding pharmaceutical companies in developing new vaccines, and offering governments and NGOs new tools for responding to food insecurity and climate change.

Nearly every major sector of the economy is benefiting from the expanded use of AI to predict potential outcomes and devise innovative solutions. Here are a few powerful examples.



Finance: Mitigating volatility, preventing fraud

Virtually every large investment institution has deployed AI to build more accurate fraud-detection models. Card issuers like Visa and Mastercard have invested heavily in AI solutions that can detect potential fraud in a matter of milliseconds. In 2020, major financial institutions spent more than $217 billion on AI applications for fraud prevention and risk assessment.[1]

Leading financial institutions are also deploying AI to explore what-if scenarios to aid decision-making around changing market conditions or actions taken by their competitors, notes Bowden.

Healthcare: Faster drug development

From medical imaging to drug discovery, AI is radically transforming healthcare. For example, with the help of a U.K.-based AI modeling company, a German biotech firm developed a new anti-cancer molecule in just eight months—a process that normally takes four to five years.[2] By simulating and comparing the structures of millions of small molecules, AI was used to identify which molecules were likely to have the desired chemical properties to bond with the anti-cancer molecule. The use of AI with molecular-level modeling and simulation allowed the researchers to narrow down the number of promising drug candidates to a small handful.

Manufacturing: A massive new design space

Digital twins of large industrial machinery are accurate digital models of real-world assets (for example, a jet engine) and AI can be applied to make predictions about things like how those assets will respond to physical stresses. Another transformative technology gaining adoption is additive manufacturing or 3D printing. Additive manufacturing means that industrial parts designers are no longer limited by traditional machining equipment, which opens a massive design space for their research and development. Industrial designers use ensembles of traditional simulations to explore the properties of parts that inhabit different areas of the design space. What's more, AI can help them more efficiently search the space to quickly identify the designs best suited to their needs, such as light-weighting parts while maintaining strength.

"If I'm trying to design a nozzle for a jet engine, for example, I can simulate different materials and shapes, then use AI and machine learning to help me quickly identify which ones are of interest for further testing," explains Arti Garg, chief AI strategist and distinguished technologist at HPE. "In other words, it culls the list of which materials show promise for being light enough and strong enough to use in my airplane. Digital twin simulations enhanced with AI/ML give us new ways to think about how we engineer parts."

[1] "Preventing financial crimes playbook," PYMNTS.com, August 2020
[2] "Tapping into the drug discovery potential of AI," Nature, May 2021

Agriculture: Feeding the world

Hewlett Packard Enterprise is working with the Consultative Group on International Agricultural Research (CGIAR) to model weather patterns that predict rainfall, so farmers can determine how much water they'll need to sustain crops between storms, as well as the right types of fertilizer and pesticides to apply.

Working together, HPE and CGIAR monitor greenhouse gas emissions from 1,000 points across India and East Africa. Increased emissions may indicate greater economic activity and population growth; the model can help researchers predict how these will impact the food supply, which additional crops may be needed, and how food relief organizations should respond.

The market for AI-based agricultural solutions is growing 30% per year and is projected to reach $6.6 billion by 2026.[3]

Business intelligence: Make smarter decisions

AI models are helping business leaders make strategic decisions across nearly every line of business. For example:

- Global telecommunication companies are using machine learning (ML) models to predict which of their customers are at risk of churning. This allows them to take proactive steps to improve customer retention, which can be five to 25 times less expensive than acquiring new ones.[4]
- Oil and mining companies are building models that can predict the location of fossil fuels and minerals, making extraction safer and more cost-efficient. They're also using AI to track emissions and reduce their carbon footprint. According to one study, AI use was found to reduce carbon usage for all large enterprises by 5 to 10%.[5]
- Shipping and logistics firms use AI models to predict container supply and demand, optimize shipping schedules, and offer dynamic pricing based on current market conditions.
- Businesses across the spectrum are using AI models to forecast consumer demand, identify potential customers, anticipate supply chain disruptions, and develop innovative new products.

The road forward

All told, AI-powered simulation continues to rise in importance across myriad industries and functions. As the world looks ahead to new and evolving challenges, the technology's role in helping to solve them is impossible to overstate.

[3] "Artificial Intelligence in Agriculture Market: A Global and Regional Analysis," ResearchAndMarkets, December 2021

[4] "Customer Retention Measurement: Metrics to Calculate and Tips to Improve Retention," Freshworks, March 2021

[5] "Reduce Carbon and Costs with the Power of AI," BCG, January 2021

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