ai:sight

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The worst of human nature created the climate crisis.

The best of human ingenuity can save nature yet.

by fractal

Eco.
logical.
Harnessing the power of AI to accelerate sustainable solutions

Sustainability capability
Organizations must now leverage tech to do more for the planet

Erm, um, ah...tificial intelligence
Innovative, literate AI: technology that speaks for itself

Get well sooner
How 40 million customers were given access to AI in healthcare insurance in record time

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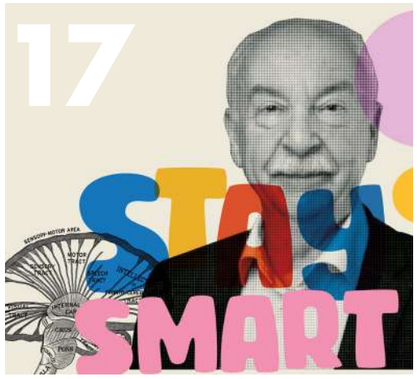

EDITOR'S NOTE

Supporting people and the planet with AI

Artificial intelligence and analytics are transforming the way we do business. Year after year, leaders recognize AI as the most impactful technology for their enterprise. They're using it for many applications, from chatbots that help people talk to machines and organizations to business intelligence solutions that support agile processes and informed decisions.

AI provides the deep insights enterprises need to target efficiency improvements, monitor progress against goals and innovate at pace and scale. These same capabilities are vital in helping them achieve a positive impact on the planet and its people.

We have two decades left to achieve the United Nations Paris Agreement goal of limiting global warming to 1.5C above pre-industrial levels. In the race to get there, companies are committing to ambitious targets for emissions reduction and sustainable operations.

But while big-picture goals are crucial to our planet's future, the small steps needed to reach them are often less clear. AI will be the key to overcoming these challenges, enabling enterprises to harmonize their data, identify their strongest sustainability opportunities, define key performance indicators, and measure and report on their progress.

Sustainability is a journey that no enterprise, department or individual can travel alone. Shared ownership of sustainability goals across the organization will be essential to achieving that 1.5C goal. Just as necessary is sharing knowledge, insight and experience across the broader ecosystem to support and inspire others to make the most positive impact they can.

We bring these insights and experiences together in this issue of *ai:sight* with real-world examples showing how business leaders ensure their organizations deliver unique experiences and services while being a force for the good of people and the planet.

I hope you enjoy the read.

Susmita Roy
Managing Editor

Harnessing the power of AI to accelerate sustainable solutions

Environment, social, and governance (ESG) issues were once seen by business leaders as a secondary concern. Now, they are a strong magnet for investment, especially among generations who will shortly be making those key decisions. Millennials and Generation Z are twice as likely to invest in funds that endorse companies with strong ESG principles, and 70% prefer to work for a company with a strong ESG footprint. As workforce issues like talent retention continue to climb up executives' priorities, satisfying those sustainability expectations has become essential for business growth.

Committing to sustainability goals is one thing, but delivering on them – and proving the results add value to the business – is a complex challenge. Organizations must choose between an abundance of frameworks like the Global Reporting Initiative and the Task Force on Climate-Related Financial Disclosures and prepare to comply with emerging governmental regulations worldwide. It's even more complex for suppliers, who may need to comply with different sustainability standards depending on their clients' expectations.

Success is built on three pillars: identifying the best strategy to tackle sustainability issues, devising meaningful ways to monitor, measure and report on the results, and empowering people across the organization to put those plans into practice. By addressing all three pillars, Fractal helps its clients frame the right problems to address and design the solutions.

Question one is the same for every organization: what exactly is the ESG problem you want to tackle? The answers are very different. We all have ideas about reducing emissions and conserving natural resources, but how does it look in the context of your business and the industry in which it operates? By putting the issues in this frame, organizations can identify opportunities to make the impact they

Every industry, and every company within each industry, has different needs, whether it's identifying targets they can work towards incrementally or realizing dramatic change to make their business future-proof.

want and explore ways to make it happen. A design-led approach is the best way to pinpoint the pertinent issues, envisage effective solutions, create prototypes and manage change so the whole organization can rethink how it does things and achieve its sustainability goals.

This design-thinking, solution-seeking approach is at the heart of what Fractal does, and it can be used to develop powerful ESG strategies. In the Asia-Pacific region, for example, a major telecom company wanted to harness innovation and technology to help reduce carbon emissions, address environmental issues and reduce consumption.

"Telstra's sustainability vision goes beyond carbon neutral operations, which we achieved in July 2020 through one of Australia's largest ever carbon offset purchasing programs. By 2025, we aim to be generating renewable energy equivalent to the amount we use, and by 2030 we'll have reduced our absolute emissions by at least 50%. We are also committed to creating a more sustainable future by optimizing the resources we use, reducing consumption and waste across our business and investing in circular solutions. Alongside an 85% increase in our network waste recycling rate, our goal is to reuse or recycle 500,000 mobile phones, modems and over devices each year to 2025."
– Fei Tan, Advanced Analytics Chapter Lead, Telstra

Telstra's vision extends beyond internal goals to support sustainability efforts across its ecosystem.

"As Australia's leading telecommunications and technology company, and a large user of energy, Telstra has an important role to play in addressing climate change and the many environmental challenges we face. We are committed to leading by example and using our scale and voice to help drive better environmental outcomes in our own operations and among our customers, suppliers and communities. We use technology to address environmental challenges and help others to do the same." – Tim Osborne, Data Solutions Manager, Telstra

Using a multi-disciplinary, design-led approach, Fractal's artificial intelligence, engineering, design and domain experts worked with employees and stakeholders from across the company in a hackathon-type process.

"We started with an immersive view of the business, including the client ecosystem, data centers, and network sites, and the data available on their systems," said Tanay Kumar, Senior Consultant at Fractal. "This was complemented by primary and secondary research, including collaboration with industry experts, corporates, and educational institutions to deepen our understanding of the trends and best practices in the telecom industry."

By combining those best-in-class examples through its design-driven process, Fractal worked with the company to synthesize and narrow down the problems it wanted to address, build a solid business case, and experiment with solutions. It then moved towards three prototypes that can be scaled to reduce emissions across its data centers and network sites.

While framing the problem is an essential starting point for a strong ESG strategy, progress can only come from a deep understanding of the organization's current position in its sustainability journey, what it aims to achieve and the actions needed to move forward. For instance, what benchmarks, baselines, and data controls should be in place to deliver a full and accurate picture of progress, not least in compliance with various governmental and non-governmental standards and regulations?

And how can you make sure everyone has the information they need to keep things on track? It's a challenge that demands all the right data to be in one place, where it can be aligned and modeled against a spectrum of well-defined key performance indicators (KPIs) and automatically audited and validated. That's where Fractal's process consulting expertise comes in.

Take the example of two major consumer packaged goods companies that needed to build end-to-end ESG reporting and visualization platforms. Both organizations faced a similar problem: structured and unstructured data coming from various sources, including third-party suppliers and their own sourcing and procurement teams. By creating a data model for ESG, Fractal harmonized and democratized each organization's data onto a single platform so it could be used across business functions, from manufacturing to procurement, logistics, human resources and governance teams.

"Each of these business functions had different processes for collecting and gathering data, as well as different KPIs relating to sustainability," said Siddhartha Sabale, Engagement Manager at Fractal. "Developing a single platform helped them to visualize the entire range of KPIs, but it also reduced overall turnaround time. Visualization reports that took weeks or months to create can now be generated at the click of a button. The organizations use these reports in their annual sustainability reporting to external audit partners. Additional simulation tools are now being developed with one of these companies, enabling it to see how sustainability initiatives in logistics or manufacturing will have a wider impact on areas like net growth or net revenue."

When all stakeholders are clued up on ESG performance against KPIs, it's easier for them to make the right decisions – and that is another area where Fractal excels. How, for example, can a global confectionary manufacturer ensure it is sourcing raw materials that are cost-efficient and environmentally responsible?

3 Key steps to sustainability

- **Plot the path** – Fractal works with enterprises to understand their current ESG maturity and create a road map for meaningful sustainability impact.
- **Make it measurable** – standardized data models and industry-specific templates enable powerful data analytics and ESG reporting so firms can understand where they are, where they're going and how to get there.
- **See the solutions** – captured data is used to identify key sustainability drivers, with scenario planning to optimize decision making and reporting against KPIs.against KPIs.

That was the big problem for one Fractal client, which needed to identify the most sustainable areas to source its cocoa supplies from. Cocoa trees are susceptible to water stress, and some plantations that supply the organization include areas with limited groundwater availability. The company needed accurate, up-to-date information to identify areas of baseline water stress (BWS – the ratio of annual water withdrawals to total available annual renewable supply) to create sustainable sourcing strategies across a given farm or geography. Its manual calculations proved prone to error. Fractal recommended an optimization solution that uses site-level simulation with inputs including BWS, emissions, the volume of raw material required, and latitudinal and longitudinal location parameters to provide recommendations about which areas sourcing teams should select for different scenarios. The result? Low-cost sourcing of raw materials with lower average BWS across the chosen farm or location.

With these three pillars of sustainability in place, companies can devise, test and demonstrate the value of their ESG measures. But to paraphrase an old saying, time waits for no man, organization, environment or planet. The pressure is on to act now and to match accuracy with speed and scale.

"Every industry, and every company within each industry, has different needs, whether it's identifying targets they can work towards incrementally or realizing dramatic change to make their business future-proof," said Bhaskar Roy, Client Partner, and Head, ESG Data and Analytics at Fractal. "As we've worked with different clients' frameworks, we have created accelerators to help speed up the journey of discovering and achieving the sustainability impacts they're looking for. That might involve framing the solution, consulting on the assessment process or creating data models to help clients create the solutions they need. Our design-thinking approach helps companies to identify the problems they want to address quickly and to tackle them through targeted strategies and scalable solutions."

A BRIEF HISTORY OF ESG

2006
ESG gains financial significance for businesses when the United Nations Principles for Responsible Investment provides a framework for incorporating ESG measures in investment decision-making.

2009
The Global Reporting Initiative (GRI), established in 1997 to create an accountability framework for companies to report on responsible environmental business practices, begins to focus on ESG issues.

2015
The United Nations launched Agenda 2030, centering on 17 Sustainable Development Goals aimed at governments, businesses, civil society, and citizens.

2020
BlackRock commits to putting sustainability at the center of its investment process, saying that integrating sustainability-related information will help portfolio managers to manage risk and make better-informed decisions.

2021
Investment in ESG bond funds reaches $54 billion.

2022
Gartner's CEO and Senior Business Executive Survey lists environmental sustainability among executives' top 10 business priorities for the first time.

The US Securities and Exchange Commission mandates reporting and disclosures around ESG for all listed firms.

Sustainability capability

Fractal is looking beyond carbon neutrality to create a positive impact on the planet

At Fractal, we see sustainability and wellness as an integrated whole. That's why we run programs to enable better educational outcomes for disadvantaged children, empower women to be financially independent and included, and improve the quality and affordability of healthcare and safe housing solutions. It's also why we seek to commit ourselves to the Paris Agreement goal of limiting global warming to 1.5C, a more ambitious goal than the earlier 2C target. Our vision is to go beyond becoming carbon neutral to impact the planet positively.

So, what does that look like at Fractal? Within the organization, it starts with two key elements: a committed sustainability culture, and accurate and current knowledge of the organization's key sustainability and wellness indicators.

Fractal nurtures a culture inspired by strong stewardship delivered by our founders Srikanth Velamakanni and Pranay Agrawal, grounded in the individual commitment to sustainability at every level of the organization. Over the years, we've built a sense of shared ownership through exercises to communicate the issues, gamify sustainability targets and set achievable goals.

By celebrating early milestones and hitting bite-sized targets alongside our most ambitious sustainability goals, we chip away at issues like reducing our use of plastics or better managing energy, water and waste at each Fractal workspace. These committed, daily actions provide the motivation and momentum needed to reach medium and long-term Fractal sustainability goals.

Setting clear goals and measuring progress is crucial to maintaining that momentum. We need to know where we are on our sustainability journey – what we are already doing, the targets we want to achieve, and our opportunities to make the best impact – so we can map our path and measure our progress. Crucially, we need to know that we are capturing the right data to give us actionable sustainability insights, even when that data lies across multiple systems. Failure to do that will result in a data void, a challenge that hampers many organizations' sustainability efforts; however, the data void challenge can be overcome.

"Sustainability is a journey that no organization or individual can make alone," says Chetana Kumar

7 ways to build the sustainability muscle

- Measure on-site activity data/behaviors and mine early insights to understand the sustainability impact you're already making while identifying the opportunities ahead.
- Generate open discussion and create a cross-functional task force to foster shared ownership of targets. Mine and measure for insights at least annually and at a frequency that is right for you.
- Seek input from organizational leadership to set targets, guide efforts, celebrate successes and provide support through challenging times.
- Set key performance indicators and monitor progress constantly.
- Declare targets and commitments – even if it's only internally at first.
- Benchmark your vision, mission and targets against best-in-class industry and global standards.
- Learn and educate: as you progress on your journey, share insights and experiences to help others grow their sustainability muscle.

Fractal faced this challenge recently when we ran a thorough carbon inventory project to understand Fractal's carbon footprint. To get the most accurate picture, we focused on the pre-COVID baseline year of 2019-20. However, we discovered that our systems were not capturing the fullest extent of Scope 3 emissions in some areas. Details about whether air travel had been direct or involved a layover – which has a very different emissions pattern – were inadequate for our measurement purposes.

Our shared ownership of sustainability goals at Fractal, combined with our best-in-class technology, enabled us to fix the problem. We used our image and video analytics capability to study historic reimbursement chits and wrote an algorithm to analyze the amount of direct and layover air travel in different regions. We quickly ensured that we were capturing high-quality data and generating the insights we needed to reduce our carbon footprint, including our Scope 3 emissions.

Alongside internal activities, we must look outside the organization and locate our sustainability efforts in a much broader context. Fractal does this by:
- Benchmarking and validating our efforts against globally recognized standards.
- Sharing our knowledge and learning from and with others.

By validating Fractal's vision, mission, and targets against globally established benchmarks, we can keep our efforts on track and share our goals and progress transparently with the wider community. When a company receives a Platinum rating from Bureau Veritas Quality International (recently gained by Fractal's Mumbai workspace for health and hygiene management) or Leadership in Energy and Environmental Design Gold certification (achieved by Fractal's Mumbai and Bengaluru, India workspaces), it tells every stakeholder within the company and in the wider ecosystem that they're hitting important milestones.

Achievements like these move Fractal toward its long-term sustainability targets – and we are working on basing those targets on the Science Based Targets initiative frameworks to ensure that our emission reduction efforts align with the world's ambition to limit global warming to 1.5C.

Sustainability is a global issue and a journey that no organization or individual can make alone. Progress is propelled by decades of great work by researchers, scientists, and regulators, sharing our experiences and learning from fellow travelers' insights. For instance, as Fractal expands its reporting to the Carbon Disclosure Project, which provides the gold standard for corporate environmental reporting, we will not only be helping ourselves to improve our emissions management but will also be contributing to a body of data that helps others to act on their environmental impact.

Fractal's clients are also leading from the front on sustainability. Their work and generous knowledge sharing constantly inspire us. With these shared insights guided by Fractal values, we synthesize environmental science and local knowledge and innovate to enrich and sustain the symbiosis between the community, the planet, and our organization.

Through this combination of measuring, monitoring, benchmarking and learning – tied together with a culture of individual ownership – Fractal continues to identify opportunities to improve environmental impact. We are creating new business practices and leveraging our technology and expertise to enable our clients and us to do more for the planet.

We're hitting early milestones using Fractal's AI and analytics expertise to positively impact energy emissions and

help our clients frame and solve the problems they face to get more from their ESG reporting.

Boosting efficiency, cutting emissions: Eugenie.ai, a Fractal incubated company, is helping major oil and gas producers, mining, and public utility firms to achieve net zero emissions, reduce operational downtime and improve efficiency.
It does this by: using remote sensing and satellite image analysis to trace the root causes of emissions to machnes and processes; and applying an outcome-focused approach to recommend actions maintenance/downtime costs.

As we develop our core expertise, people and ecosystems, we chip away more at that shared goal of keeping global warming below 1.5C. By taking informed, measured steps toward that bigger picture, we are building our sustainability muscle to bring a positive impact to the planet, its people, and communities beyond our immediate value chain.

Sustainability is a great muscle for any organization to build - and as with any muscle-building exercise, achieving the vision requires a combination of knowledge, commitment, monitoring and validation.

Chetana Kumar
Head, Corporate Social Responsibility & Special Projects
Fractal.ai

Chetana helms the corporate social responsibility program and Special Projects at Fractal, where she is helping shape the strategy for leveraging Fractal's strength in analytics and artificial intelligence to create greater social impact. She is also the Chair of the Fractal Critical Event Team and the ESG task force at Fractal. She is known for her attention to design and detail, sophisticated execution and meticulous administration of projects. With a passion for technology and medicine, Chetana is especially interested in leveraging technology to fine-tune the impact of CSR initiatives. An active public speaker since her days as a student of Law and Management, she also enjoys building her trainer's muscle during ESG/Sustainability training sessions at Fractal.

Despite our imperfect grammar, hesitations and ambiguities, innovative literate AI reads emotional context and tone of voice, establishing understanding with ease.

Conversational AI has come a long way since the Eliza chatbot was developed in the 1960s. Today, enterprises in every industry are adopting the technology for an expanding range of use cases. Meanwhile, virtual assistants like Alexa, Google Assistant, and Siri have been welcomed into consumers' homes to help with everything from smart lighting to home entertainment. They even tell jokes.

But there are still some rough edges. Human language is a flexible system developed over millennia. We naturally understand each other despite our imperfect grammar, hesitations, and ambiguities. We read the emotional context from facial expressions, tone of voice, and other cues. Conversely, our interactions with virtual assistants lack that rich context, and conversations tend to falter after two or three turns – although we have developed fallback mechanisms like asking more questions to clarify or passing the conversation to a human operative. For those who are not computer literate, the need to learn an interface can be a significant barrier. Conversational AI promises to remove these barriers between people and technology.

At Senseforth, our vision is to make technology human-like, to remove those barriers, and make emotion, personality, playfulness, and social skills a part of every conversational AI-driven experience. It might seem like science fiction, but with considerable innovation already underway in these areas, the dream is on track to become a reality over the next few years.

Our vision is to make technology humanlike, to remove those barriers and make emotion, personality, playfulness and social skills a part of every conversational AI-driven experience.

For instance, today, we're creating hybrid voice, text, and graphics experiences to enable richer, more free-flowing conversations across different contexts. This could be a voice in the car to minimize distractions, text for checking your bank balance in a public space, or graphics so a virtual shopping assistant can bubble up images of suitable items to choose from. Further, with graphical user interface elements blended into the experience, the next best actions can

Providing an antidote to the information pollution that characterizes so many digital experiences today.

be suggested and accepted with the click of a button, guiding the user all along the journey.

Capabilities like these are already solving some tough business problems for our clients. For example, in our work with the Government of India, we've developed a multilingual citizen assistant to connect people – including those who live in remote rural communities – with several services at the federal and state levels.

Meanwhile, the virtual banking assistant we built for a leading Asia-Pacific bank can interact with users using natural language. It handles 12 million queries monthly, provides instant, personalized recommendations, and generates thousands of qualified leads. Its ability to carry on multiple conversations simultaneously means it can handle the workload of hundreds of humans.

Also in work are the hyper-personalization capabilities to enable timely, focused suggestions in response to the user's context, interests or habits. It is an antidote to the information pollution that characterizes many digital experiences today. For instance, if a bank customer receives big money in their account, the virtual assistant can proactively recommend a fixed deposit product to earn a better interest rate.

Evolution of Conversational AI

Wave 1.0: Experimental

Mid 1960s to 2000s

Development of experimental interactive interfaces (e.g. MIT's Eliza) using rule-based, pattern-matching processes

Wave 2.0: Sub-human

Early 2010s to c 2030

- Products are being built and adopted e.g. Alexa, Siri for consumers; call center chatbots and virtual assistants for enterprises.
- Solutions typically fail after two or three turns in the conversation.
- Continuous development of fallback mechanisms and new capabilities drive towards a more human-like interaction.

Wave 3.0: Human-like

Late 2020s onward

- Empathy, emotion, personality, playfulness and social skills are part of conversational AI driven experiences.
- This wave may start in 5-10 years time, but current experiments, in areas like machine learning and natural language generation and understanding, are already bringing it closer.

Wave 4.0: Superhuman

c 2050 and beyond

- Conversational AI woven into our daily lives.
- Everything becomes conversational - appliances, software programs, furniture, automobiles, buildings, public spaces etc.
- Use cases move beyond personal and business assistance to include e.g. therapeutic or motivational experiences, conflict management and intellectual discussions.

It's not all about the latest technologies, though. By reaching out across social media channels with conversational AI, enterprises can deliver a more intuitive and immediate experience that keeps time with the communicative rhythms of hyper-connected digital natives. These users are plugged into an array of social media apps, and they expect every organization they deal with to meet them on their channel of choice. It's impossible for the human workforce, but conversational AI can easily cover it. Recognizing a user signed into a secure channel can cut out repetitive authentication processes, so the conversation flows more easily.

Finally, as we work towards frictionless communication between people, machines, and organizations, we must address the ethical issues head-on. However human-like – or even superhuman – the technology becomes, we need to make sure it explains itself and is inclusive and unbiased at every turn. It needs to represent the best human interaction – then, it can become the smart, perceptive, and trusted associate who helps us get where we want to go and who we're happy to take along for the ride.

Shridhar Marri
CEO and Co-Founder
Senseforth.ai

Shridhar Marri co-founded Senseforth.ai, a leading-edge conversational AI platform, in 2017, building on a career that has seen him build significant expertise in technology, design and entrepreneurship. He is passionate about building human-like experiences to enable frictionless interaction between people and enterprises.

How 40 million customers were given access to AI in healthcare insurance in record time.

A US-based Fortune 100 health insurer was losing over 4,000 hours of productivity per month and facing budget overruns amounting to millions of dollars. Why? Because it was attempting to scale its operations to serve over 500 AI services, but without machine learning operations (ML Ops) or an effective governance structure. This was cumbersome for IT production and operational management and wasted time and money.

Time for transformation

The insurer discovered that Fractal's combination of AI, engineering and design expertise could help it define the ML Ops and governance strategy it needed to operate its AI services. As a result, it set Fractal an ambitious goal: to establish the architecture and run a pilot. With massive potential savings at stake, time was of the essence.

Rising to the challenge

The Fractal team started by reviewing the insurer's existing technology and use cases that need to be served. It identified a prioritization framework and defined a roadmap to implement a scalable ML Ops framework in the business and could immediately identify the cost-saving potential. It then aligned all stakeholders, including IT operations, and specified the optimal technologies considering existing governance and IT guidelines.

The chosen technologies included an in-house automated machine learning (AutoML), a customized feature store to manage over 17,000+ features for batch and real-time services, and MLflow to orchestrate CI/CD (continuous integration and continuous deployment) as well as model registry and model versioning.

With massive potential savings at stake, time was of the essence.

These technology components' scalability, serviceability, and maintainability uniquely matched the client's requirements in relation to feasibility, desirability, and viability.

Once this had been organized, the Fractal team set up a specialist engineering unit to selectively scale high-priority AI services in an ML Ops framework. It then deployed and tested the pilot service end-to-end and ramped up the ML Ops services to incorporate other scalable technologies.

Rapid results

A design-driven architecture and strategy enabled the Fractal team to deliver the engagement rapidly. With a further investment of 24 weeks, the pilot engagement on ML Ops was complete, and the client organization realized significant time and cost savings. The ongoing scaling of further ML models was reduced from months to weeks.

The future is now bright. The Fractal implementation has opened a path to fast and cost-effective expansion of the insurer's AI services, enabling it to meet the needs of over 40 million customers in real-time and at scale.

IN BRIEF

- A Fortune 100 health insurer was losing 4,000 hours per month, and billions of dollars.
- It needed an ML Ops platform and effective governance structure for 500+ AI models.
- Fractal planned and defined a new architecture and strategy in just 12 weeks.
- Huge cost savings were gained as soon as the pilot was complete.
- The insurer now has a platform for expanded AI services to over 40 million customers in real-time.

Renowned psychologist Professor Gerd Gigerenzer shares insights into the importance of human decision-making in a time of growing automation

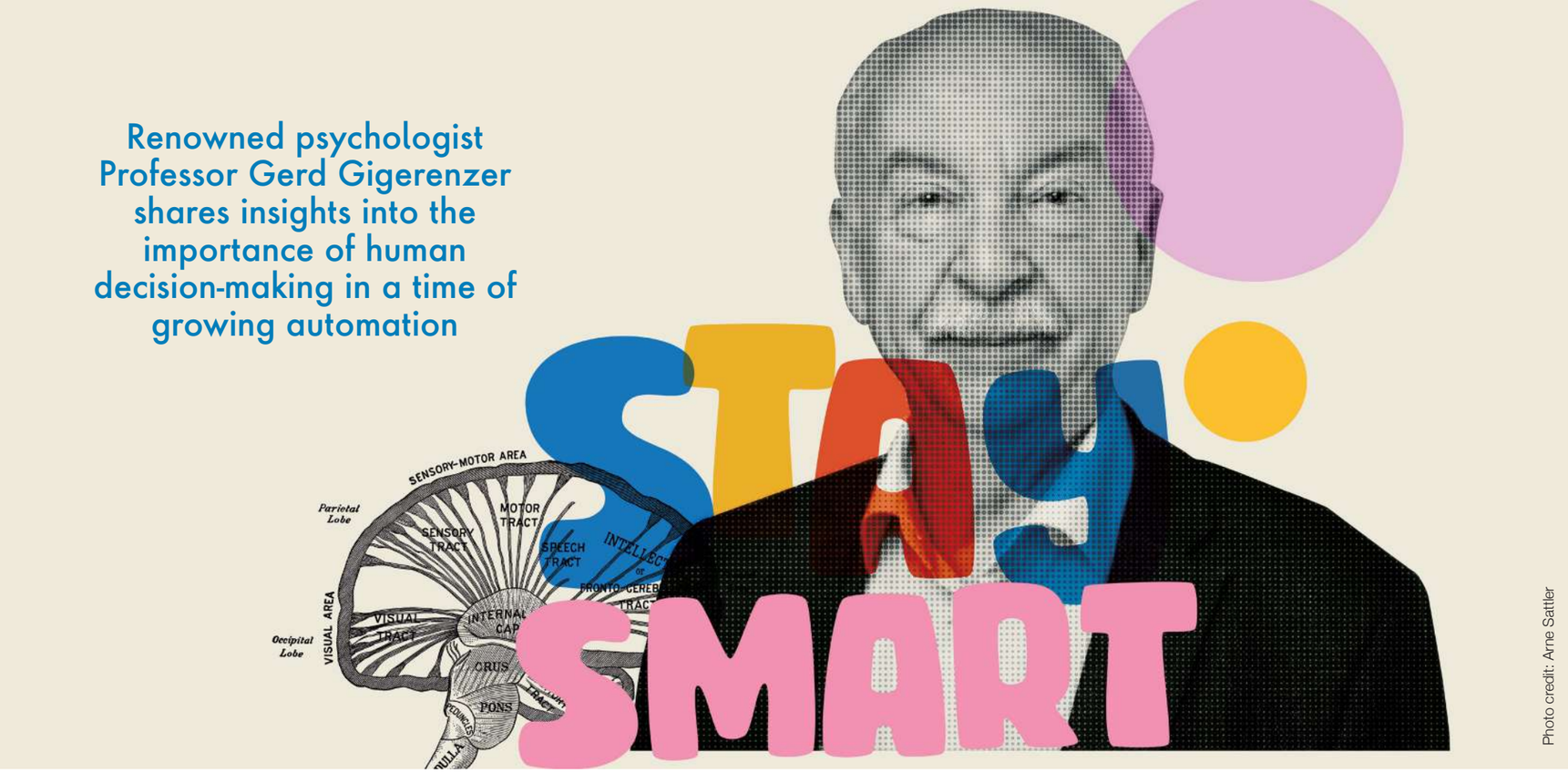

Photo credit: Arne Sattler

Over a long and distinguished career in psychology, Professor Gerd Gigerenzer has investigated how people make decisions when there are limits on information and time. Here, he explains why he continues to believe in the power of human intelligence and what we can learn from our minds about how to best use AI.

Why is it that you believe that the human mind is still able to perform better than artificial intelligence in certain situations?
It's very important to distinguish between stable situations, where tomorrow is likely to be the same as today and the day before, and unstable ones, which are ill-defined and contain uncertainty. The difference between these two situations is essential for understanding what AI can do for us. It finds success in stable situations, including in games like chess and Go, and industry applications where AI can carry out routines without much human thinking required.

Situations where uncertainty is involved are a very different proposition. There's no evidence that deep learning and complex models can do any better in such situations than simple rules which human intelligence relies on, otherwise known as heuristics. In my studies, I've found that the answers delivered by simple heuristics can be better than those provided by highly complex models.

What are the advantages of a decision-making process based on heuristics rather than a purely data-driven, 'optimizing' approach?
Firstly, in an uncertain situation, the concept of an optimizing solution is a total illusion. If you try to optimize, you're just hoping that the future is exactly like the past, which is unlikely. Highly complex models are sensitive to small systematic changes and can easily fall apart. Under uncertainty, you need a robust approach based on smart heuristics rather than optimizing.

An example is the case of Harry Markowitz. He was awarded the Nobel Memorial Prize in Economic Sciences for his work on mean-variance optimization, which concerns solving the question of how to invest a certain sum into assets. However, when he invested his own money for his retirement, he did not use his Nobel Prize-winning optimization model. Instead, he used a simple heuristic known as 1/N, which allocates funds equally across all assets under consideration. In contrast, his highly parameterized model needs to estimate all future means, variances, and covariances from past data. The more you have to estimate, the more estimation error you can expect.

1/N, however, is a heuristic. It doesn't estimate because it uses zero data. While it may have a bias, you get rid of estimation errors, and studies showed that 1/N could make more money than optimization in the real world. Less can be more.

Could you share another example of a situation where heuristics worked better than a purely data-driven AI?
One such instance is Google's attempt to predict the spread of the flu between 2007 and 2015. The assumption was that people with symptoms would enter search terms related to their illness. So it would be possible to find out where the flu is spreading based on the frequency of those searches. Google's engineers analyzed some 50 million search terms, tested 450 million different algorithms and developed a secret algorithm that used 45 terms (also kept secret).

However, this approach failed. When there was an outbreak of swine flu in the summer of 2009, the algorithm could not recognize it because historical data had taught it that flu was high in the winter and low in the summer. In response, the engineers continued to make the algorithm more complex, which did not improve results.

In contrast, what does the human brain do if it has to predict something highly volatile? It doesn't use big data. Instead, it only uses the most recent pieces of information, which are the most reliable ones. We, therefore, used a heuristic in which we only took the most recent data point available for flu-related doctor visits and nothing else and used it to predict next week's visits. This simple heuristic predicted the flu much better than Google's algorithm over the eight years Google made predictions. One data point can be better than big data.

This result shows that looking at how human intelligence deals with volatile situations can be useful and not to think that ignoring some information is always bad.

Suppose a heuristic approach is more successful in many real-world situations; how can we take those lessons to use AI more effectively?
There are two ways, the first of which is very simple. When you get an offer for an AI application, evaluate whether it would be in a stable or uncertain situation. If it's an uncertain situation, keep away from current AI applications and solve these problems yourself.

Then there's also the question of how we can use psychology to make machines smart. Psychological AI is the original vision of AI proposed by Herbert Simon and Alan Newell. Today, many machine learning researchers do not even consider how the brain solves problems. Yet deep learning is not the route to true intelligence because more computing power makes algorithms faster but not smarter – it does not generate intuition and common sense. For instance, children need to see only a single or a few U.S. school buses to recognize all others, while deep artificial networks need thousands of pictures and can still be fooled into believing that a picture that consists only of horizontal yellow stripes also represents a school bus. Deep learning is fundamentally different from human intelligence.

The future lies in using insights from the human brain to integrate present machine learning with psychology AI. We need to get causal thinking, intuitive psychology, and intuitive physics into AI. That's the way forward.

What do you hope readers of your new book will take from it?
AI has been sold as a super-intelligent assistant that tells us what we should do, encouraging us to lean back and dutifully follow its recommendations. That's the wrong idea. To realize the possibilities of smart technology, we need to get smarter and understand what it can and can't do. For instance, Elon Musk tells us every year that we will have self-driving cars (Level 5) the following year. Level 5 means a car that is able to drive safely under the full range of driving conditions without any human backup. Despite the ongoing marketing hype, no such car exists. Given the unpredictability of human drivers and the difficulty for AI in dealing with uncertainty, I predict that we will not have self-driving cars of this kind.

We will likely get something much more interesting: Level 4 automation, with cars that can drive without human intervention in restricted areas. That's a technology already existing and a vision we can apply more widely. Level 4 is interesting because it will change our environment. It requires a stable environment and humans that are more predictable if we are to profit from the limited abilities of AI. And that may eventually mean that we humans will no longer be allowed to drive.

The concept of an optimizing solution is a total illusion. If you try to optimize, you're just hoping that the future is exactly like the past.

AI is not just a technology that will help us make things easier. It will change us like many technologies have changed us. We must adapt to take advantage of it, and that's what I'd like readers to take from the book. ●

Read more from Professor Gerd Gigerenzer's new book 'How to Stay Smart in a Smart World: Why Human Intelligence Still Beats Algorithms,' available at leading booksellers. Grab your copy with this QR code:

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