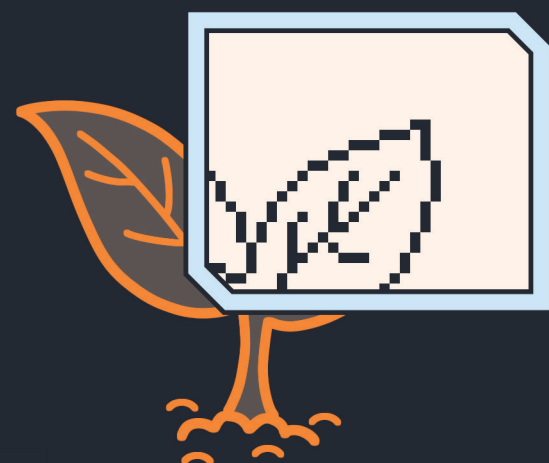


How we can use AI to create a better society



Foreword



Previous reports from the Tech for Growth Forum have examined the ways in which technology, particularly artificial intelligence, can help businesses to grow. In this report, we turn our attention to the social contribution that AI can make and ask how society can take advantage of this remarkable technology to tackle many of its most pressing problems, from climate change to healthcare.

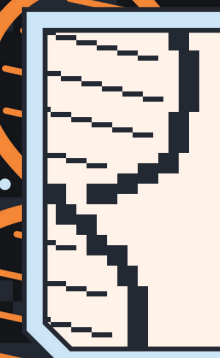
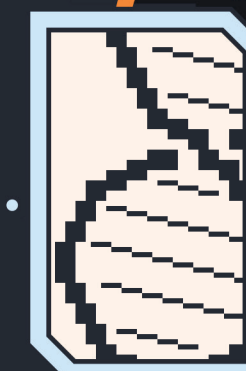
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Tech for Growth Forum Editor
Financial Times

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How we can use AI to create a better society

Companies are looking into the ways in which AI can reduce humanity’s impact on areas such as agriculture, healthcare and environmental conservation. By *Lucy Colback*

Usually the FT Tech for Growth Forum looks at technology in the commercial context. This report, however, examines how next-generation artificial intelligence can be a force for good.

We will look at the ways in which AI can reduce humanity’s impact on the planet and bring about societal improvements. Our focus this time is on agriculture, healthcare and environmental conservation.

The damaging effects of mankind’s exploitation of the earth’s resources are becoming clear. Our use of energy will have to be less polluting if we are to hold the rise in global temperature within the limits set by the Paris Agreement in 2015.

Climate change has caused extreme weather events to become more frequent. Germany, Austria, Hungary and Spain have all suffered storms and floods. In the US, Hurricane Helene caused severe damage much farther north than is usual and the LA wildfires which broke out in January 2025 were exacerbated by unusually dry weather for the season.

Managing resources, notably food and water, will become increasingly important, especially as the world’s population continues to rise.

The Covid-19 pandemic and its effect on national economies showed the importance of maintaining a healthy global population.

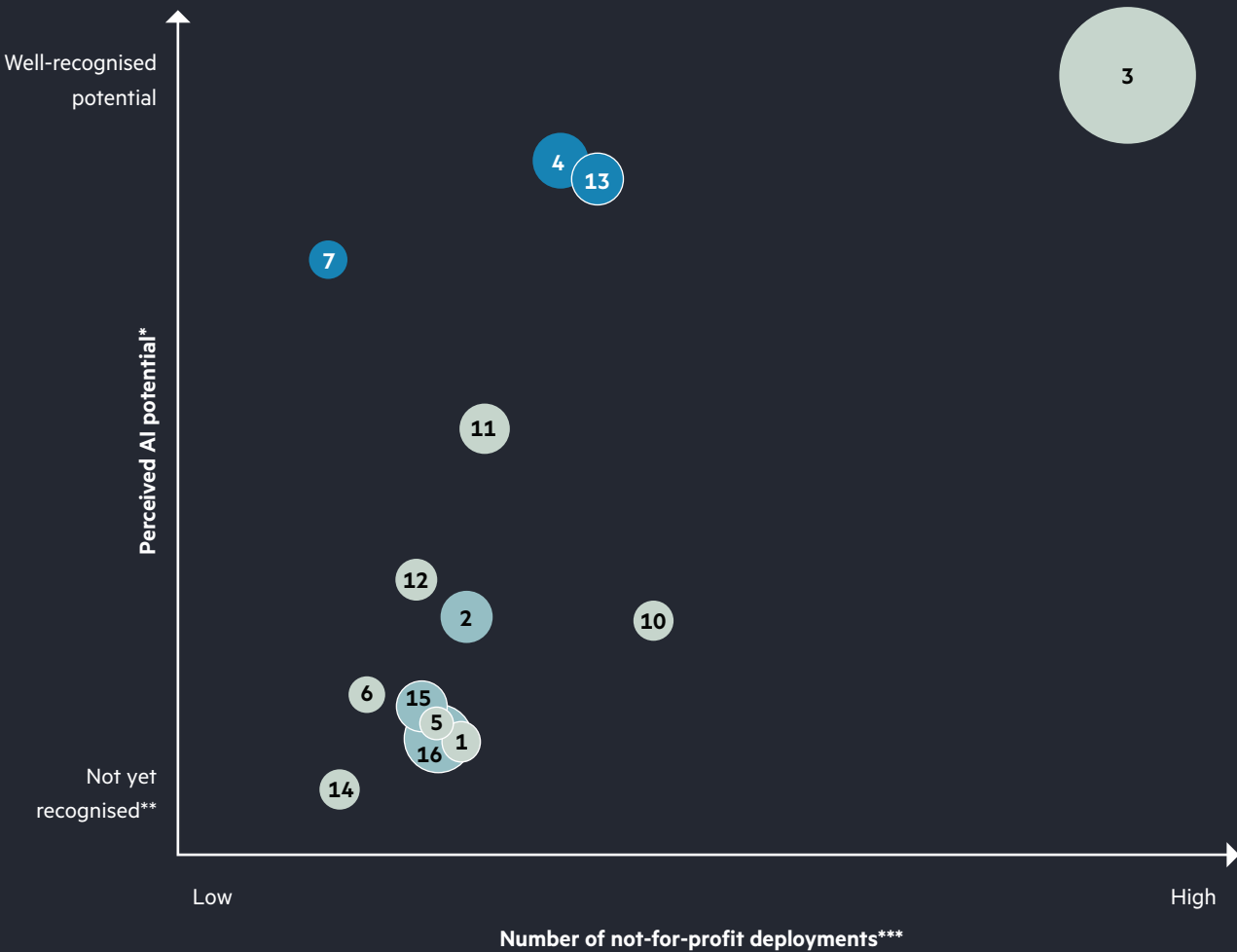


Glossary

- Precision agriculture**
A management strategy that gathers, processes and analyses temporal, spatial and individual plant and animal data and combines it with other information to support management decisions according to estimated variability for improved resource use efficiency, productivity, quality, profitability and sustainability of agricultural production. Earliest techniques include GPS auto-guidance of tractors, which allows for precise application of resources – such as fertiliser and water – only where needed. Now, sensors on tractors can also determine which parts of the crop need more attention.
- LLM**
Large language model. A deep learning algorithm capable of taking in vast amounts of content and producing human-like writing or realistic imagery.
- SLM**
Small language model. A compressed and more refined version of a large language model. It uses fewer parameters than an LLM, therefore less computing power, making it more accessible. They might also be trained in more niche specialisations, for instance to give medical advice, rather than to answer any and all questions put to them.

The number of not-for-profit deployments does not necessarily reflect the perceived AI potential for each sustainable development goal

- Bubble size reflects the number of AI-enabled use cases identified
- Relatively high number of use cases identified given low perceived AI potential
- Lower level of deployment than expected based on higher perceived potential



- 1 No poverty
- 2 Zero hunger
- 3 Good health and well-being
- 4 Quality education
- 5 Gender equality
- 6 Clean water and sanitation
- 7 Affordable and clean energy
- 10 Reduced inequalities
- 11 Sustainable cities and communities
- 12 Responsible consumption and production
- 13 Climate action
- 14 Life below water
- 15 Life on land
- 16 Peace, justice and strong institutions

* AI potential determined through survey of ~60 experts representing 48 organisations (incl not-for-profits, foundations, technology companies, start-ups, academic institutions and government) and 17 countries in response to the following question: 'What are the top 5 Sustainable Development Goals (SDGs) in the list below where you think AI has the highest potential to accelerate progress toward the SDG targets?'

** There may be potential for AI use, but the surveyed experts are unaware of it at this point

*** Not-for-profit deployment determined from number of sample deployments in a collection of 1,121 AI applications largely deployed in not-for-profits

Source: McKinsey

The Future for Agriculture

The unpredictability of the weather has not only caused acute loss of life and assets, it is having a chronic effect on farm yields on every continent. The pressure on agriculture is expected to increase.

With population growth highest in some of the lowest-yielding geographies, “feeding the world” will be more challenging than ever.

This year Professor Patrick Schnable, who directs the Plant Sciences Institute at Iowa State University, told the BBC: “All projections show major losses in crop yields due to climate change. A 10 per cent or 20 per cent reduction in corn yields would be catastrophic.”

Increasing agricultural yields will be essential. This is where AI can help: improving farming techniques will lift output in one area even as another suffers from storms, heat or floods.

We must contain climate change in order to avoid exacerbating the effects of extreme weather. Lower emissions can be achieved if farming methods change. The UN Food and Agriculture Organization says more judicious farm management could offset up to a third of agricultural emissions.

Water, water everywhere

Our use of water also needs to be rethought. Lakes and rivers are already drying up due to the combination of climate change and our careless approach to water usage. These are not singular issues that affect some countries and not others: in the US alone, some water sources are disappearing even as floods threaten more communities than before.

Demand from agriculture, commerce and consumers — all used to unrealistically low prices — combined with reckless management of a resource too often considered inexhaustible, means that water usage does not reflect the realities of its distribution, especially in developed markets.

For instance, drought-prone California is the most productive agricultural state in the US but it relies on intensive irrigation for crops such as nuts. A 2024 study, Field-scale Crop Water Consumption Estimates, used data and machine learning and concluded that the Central Valley’s demand for water could fall by 93 per cent if farmers switched to less common crop types.

Such a strategy is unrealistic because it would reduce profitability but the possibility of letting some fields lie fallow could make a difference and be more commercially acceptable.

The issue, in California at least, is likely to be forced with the renegotiation of the operating guidelines for the Colorado River Compact. The details of this 1922 treaty between seven US states are due to expire in 2026. Squabbles are breaking out over which state must reduce usage and how much each should pay.

In central California, the San Joaquin “breadbasket” valley experiences many problems related to too much water being taken, ranging from drinking water contamination, to species and habitat loss, to general land subsidence.

Overall demands on farmland

The demands we place on farmland are huge. Although overall agricultural output continues to grow, the rate of expansion is slowing as overworked soils struggle to produce. The better news is that technology and improved efficiency are helping to keep output afloat. Farmers may have to rely on technology more and more: farm labour forces in mature markets are declining, by as much as 2 per cent by 2033 in the US.

Regenerative agriculture could help, with data gathered through a similar approach to that taken by the “field-scale crop water” study. It could guide farmers to aim for greater sustainability, encouraging a holistic approach based on replenishing the goodness in soils.

Supporters of this idea say better soil will both draw down carbon and store more water. Coupled with AI-directed irrigation of plants, this could make water go further and reduce farming emissions.

Drones, sensors and phone apps all help

Technology powered by AI is behind sophisticated “precision agriculture” in markets such as the US. It provides farmers with detailed information so that they can target areas of cultivation that need greater care.

Image analysis has a use at both macro and micro levels. Armed with data from drones and tractor-mounted sensors, machine-learning algorithms can monitor crops and provide advice — for instance that nutrients are short in a particular part of a field — while phone apps such as Agrio help with pest identification.

As the agricultural labour force diminishes, AI can fill the gap in many ways, taking on repetitive or structured tasks such as sorting potatoes, planting or weeding. Equipment from John Deere, the machinery maker, offers automatic guidance on managing seed and nutrient placement and it provides updates on equipment performance. The Smart Cultivator from Stout, a Californian AI company, weeds fields without affecting crops. It claims to have 99 per cent accuracy.

AI also has a role in optimising the crops themselves. The AI Institute for Resilient Agriculture, founded in 2021 under the banner of Iowa State University, aims to improve the resilience of farm systems by creating digital twins to model plants and fields.

In aquaculture, Bosch Business Innovations uses microphones and AI to analyse the behaviour of shrimps. Its system can detect when the crustaceans are hungry, allowing for precise feeding. Additionally, it can avoid overfeeding and flag up signs of illness, which allows early intervention. Productivity has doubled for farmers who use this technology.

Such initiatives are not limited to advanced markets. India, the world’s largest producer of milk and pulses, has embraced AI in areas from irrigation to pest management. Given the fragmented nature of the sector in a country with smallholder farms and 1,600 languages and dialects, technology is best served in ways that are locally relevant and digestible.

Raising yields, improving quality and better market prices

Digital Green, a global development organisation based in San Francisco, is working to achieve this in India, Kenya and Ethiopia. Its multilingual AI chatbots can be operated by agents and deliver specific advice to individual farmers.

The company is behind Saagu Baagu, an initiative in Telangana, south-east India, run under auspices of the World Economic Forum. This has raised yields for 7,000 chilli farmers, reduced use of resources and improved quality, pricing and incomes. KissanAI also offers access to voice-based knowledge about pests and crop management.

In other regions, advanced insights can be hard to deliver with consistency. David Bergvinson, founder of BeSustainable.io and a former leader of the digital agriculture division of the Bill & Melinda Gates Foundation, says poor infrastructure in some parts of Africa limits the effectiveness of “real-time decision-making based on weather data”.

Yet such information is more critical where vast tracts of land depend on rain. He says: “Agriculture is a weather-driven sector. Having weather [information] as a driver for making appropriate decisions to increase productivity, but also to manage risk and time market entrance, becomes very powerful.”

Always take the weather with you

Tomorrownow.org is developing and expanding weather-based advisories in Kenya with the backing of the Gates Foundation. Its aim is to enable African farmers to become more climate resilient by providing access to machine learning-based weather information from Tomorrow.io via ways such as SMS. This access is beginning to make a difference in Kenya, where alerts help farmers make informed decisions.

The pressure on resources, particularly water, may change the way we operate our food system, Bergvinson says, moving it away from productivity towards “nutrition and profitability per drop [of water]”.

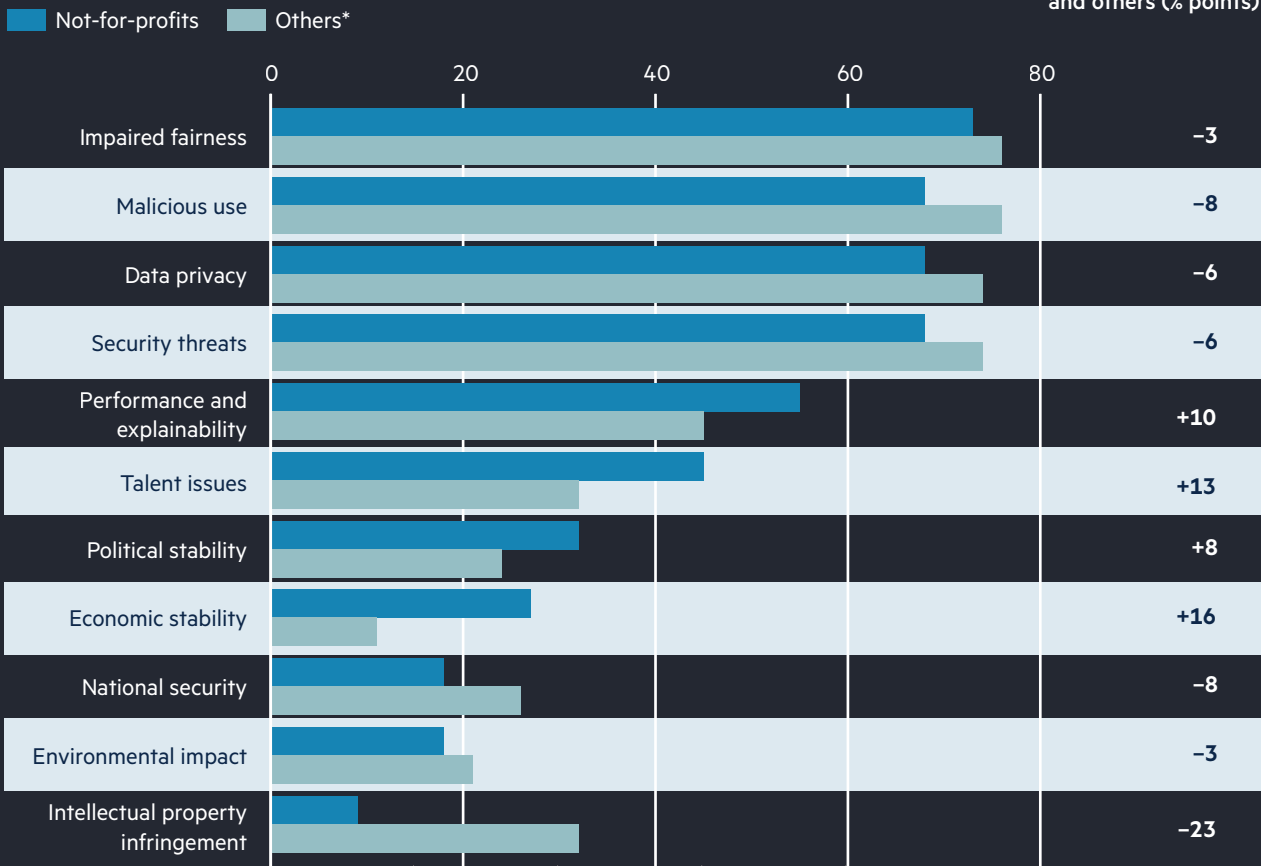
The good news is that AI can optimise how we use water for food production. It will enable us to plan a course of action to mitigate and adapt to climate change. Increasingly accurate modelling is helping us to identify previously overlooked factors such as the effect of cloud phase. It gives us a better grasp on the complexity and pace of change.

Broad access to AI means that innovation is no longer the preserve of the expert. Dryland agriculture in semi-arid areas, from India to Africa to California, can all be enhanced by predictive technology.

AI risks presenting the largest challenges in deploying AI for achieving SDG targets

% of respondents including this topic in their top 5

Delta between not-for-profits and others (% points)



*Impaired fairness' was framed as 'bias and fairness' in the survey; 'performance and explainability' was framed as 'explainability'; 'data privacy' and 'security threats' were combined in the survey
* Includes for-profits, think tanks, academic institutions and consultancies
Source: McKinsey

Environmental Conservation

Connected to the demand for both farmland and resources, global deforestation is extensive, with most occurring in Brazil and Indonesia.

Logging and land clearance for subsistence and profit exacerbates floods, landslides and drought and is said to be responsible for up to 20 per cent of greenhouse gas emissions. Habitat destruction and poaching put the survival of numerous species in doubt, threatening the biodiversity that defines a healthy ecosystem.

Conservation is the flip side of the exploitation coin — and AI can be used to shape strategy.

According to a 2023 Nigerian study published in the World Journal of Advanced Research and Reviews, AI can monitor ecosystems and identify rare or endangered species through sound and image analysis.

It will also warn about environmental problems as they emerge.

Satellite images, which are trained on models, help to sustain the health of habitats by identifying areas where there is illegal logging as well as those in need of restoration. The scale and accuracy are greater than can be achieved by manpower alone. Through analysis of migratory patterns and human activity, AI algorithms can predict where poaching might occur, helping conservation teams to react with greater effect.

The International Union for the Conservation of Nature highlights the use of video analysis to pick out rare species from hours of footage and to preserve biodiversity by flagging environmental issues. In China, satellite imaging and AI have detected forest fires as they begin and helped to reduce their spread. In Wisconsin, AI-driven camera systems can reduce the speed of wind turbine blades when rare birds approach.

Machine learning algorithms can sift and learn from data so speedily that they can forecast which threats plants face, as well as predict patterns of bird migration.

Environmental DNA, a force for the future

To these conservation methods, the World Economic Forum adds the study of environmental DNA which provides detailed insights into ecosystems. Via eDNA, sloughed-off cells or faeces can be used to identify the species and organisms that contribute to a healthy environment.

Some technology can even quantify the pros and cons of taking specific actions to try to preserve biodiversity. Programmes such as Conservation Area Prioritisation Through Artificial Intelligence will identify areas where biodiversity can most effectively be preserved and calculate the benefits of doing so, offering more compelling arguments than a random selection of conservation targets. Budgets, human pressures and climate change are all inputs into the system’s simulations.

Medicine and Healthcare

At a basic level, the opportunities to deploy AI in healthcare are similar to those in other industries. AI can take on administrative and repetitive tasks and so boost productivity. To give one example: a clinician can use an AI app to listen to a consultation and add a summary to a patient’s notes.

One impediment to AI taking on sophisticated tasks is the diverse nature of healthcare data as well as poor data hygiene. Caroline Chung, vice-president and chief data officer at the MD Anderson Cancer Center in Houston, Texas, says that the healthcare sector has struggled for years to improve transparency and establish consistent data. She points out that the sector’s provision of services is based on a “human to human connection” which is always prioritised over standardised paperwork. To take advantage of AI, the healthcare system will need to explore better ways to record and manage data.

One approach, she says, would be to require data standardisation, although this would not be easy. Curating and cleaning data retrospectively is only a partial fix. While it is feasible that data so processed can be used to train models, the latter tend to fail as new non-standardised data is generated at the point of care.

“Metadata could help us cross-calibrate and understand how these data sets are different — the data that you’re applying when you’re implementing and using the model versus the data set used to train or test the model.” This might help to select better models or ascertain why some fail, but even this degree of information is not captured continuously or consistently. “Everyone recognises it’s a problem but they don’t know the exact ‘why?’ to have an approach to troubleshoot these challenges.”

There are some areas of healthcare that have been digitised for some time and where AI can make a difference. Diagnostic imaging, such as in radiology and cardiology, is a field where data has been generated in a consistent fashion and is “machine consumable”.

Quantum sensors and brain imagery

The homogeneity of imaging data allows models to be trained on historical images. The sheer volume of information they consume can enable them not only to see existing issues but to predict problems. In January 2024 the US Food and Drug Administration approved the first AI-powered skin cancer diagnostic tool; in 2021 Paige. AI was approved for use in prostate diagnostics, and two years later it was applied to the detection of breast cancer.

Brain imagery will benefit too. Quantum sensors are used to monitor brain activity and, due to their small size, can be worn while patients move around. This adds a new dimension to how an activity is observed and measured.

Where data can be consistently gathered, other applications for AI are emerging. In the treatment of diabetes, AI models read data from the “closed loop” of glucose monitoring and insulin delivery. The calibrated and continuous measurements are reliable and trustworthy enough to direct the required treatment.

Elsewhere AI can improve analysis of DNA, helping to predict patient susceptibilities to disease or complications and catch these at an early stage, sometimes before they become apparent in other ways. Predictive analytics, which examines historical data to identify trends and patterns, can identify high-risk factors and mark a patient for intervention.

Pattern matching will find new uses for old drugs

Companies such as Deep6AI, Saama and Medidata all use AI to help design studies and select clinical trial populations that are optimised for those patients most likely to respond to treatment. Such selection can lower costs by finding eligible candidates faster, as well as pulling in candidates from wider pools.

EClinical Solutions, the data and analytics platform and biometrics services provider, says generative AI could facilitate new drug creation by predicting molecular behaviours or simulating patient populations to test treatments in a virtual environment.

Chung also says that AI pattern matching in patient data will help find new applications for old drugs. She says the enthusiasm around the technology is pushing providers to find ways to homogenise data to allow more extensive uses. Up to this point the efforts have been more organic but there have been “some early movements around generating more structured reports”, with the American College of Surgeons requiring more structured operating room reports, for instance.

There are hurdles but the health sector is rapidly expanding its use of AI. According to Snowflake, the cloud data warehouse, the growth in data tagging and the use of Python coding indicates a leap in the application of AI — or at least a jump in exploratory programming. A clutch of universities, such as Cornell in New York, now offer courses in data management and programming for healthcare. They teach students to use technology to help them predict whether a patient could develop sepsis, for instance.

Raise the floor and lift the ceiling

Future patient care could be enhanced by AI, with practitioners having rapid access to the specific and detailed data for an individual. Patients could also have round the clock access to advice based on their own data.

Chung says “many people are going after the sexy blue sky solutions” with AI. She says more focus on “raising the floor” of medical healthcare is as important as elevating the ceiling, especially when it comes to expanding and improving access to healthcare and reducing disparities. “If people are unable to travel, can you find better solutions for delivery?”



Drawbacks

From a conservation and climate perspective, there is tension between deploying AI and the land and energy required by data centres. As was pointed out at a recent FT Climate Capital Council roundtable, AI requires a lot of energy. A ChatGPT search can take 10 times as much energy as a regular Google search. Some experts believe that increased demand from AI could increase energy consumption by 250 per cent within five years.

While AI is a powerful tool, it is still only as good as the data that feeds it. Consequently, a lot of effort needs to go into sourcing, cleaning and maintaining inputs. Chung says that when searching for correlations in data, for instance in cancer imaging, time is also a factor. An image of a cancerous cell in any given moment will look different soon afterwards, so timing of the data being used is highly relevant.

Ethical considerations are also paramount, particularly in healthcare. Not all patients will be keen to have their data shared even anonymously, and having apps listen to consultations could be fraught with problems.

The Importance of Mindset

While there are plenty of advantages to using AI, it is critical to identify the problem that needs to be solved before buying into a technology. Happily, AI is approaching the point where it can help here, too. The next stage, Bergvinson says, is where AI is given the context to understand a problem for which it can then “backward integrate these technologies to deliver the solution”.

For many social projects, technology will have to be blended with humans’ soft skills for a partnership to be effective.

Similarly, recommendations based on technology need to account for the human element. Even with the delivery of weather forecasts, any messaging must account for the constraints on each farmer and their decision-making process to make it relevant.

Finally, AI needs safeguards to ensure that “nefarious intent” is not amplified.

Bergvinson says: “It’s in everyone’s interest to manage this carefully. If we burn the bridges of trust it will be very hard for society to be willing to have a second go.”

Next Steps

Early adopters of AI are convinced that while chat large language models are most prevalent now, the next phase will involve small language models designed for specific uses. These could have niche applications that give access to specialised knowledge in response to a spoken query.

Bergvinson says: “While there’s a huge investment in LLMs costing several million dollars, the SLMs that are focused on specific verticals within a sector will play an increasingly important role for smaller enterprises to deliver value to society in the medical, education and agriculture sectors.”

Personalisation is gaining ground in all these areas, including nutrition, which he describes as “the nexus between health and agriculture”. This shift is already under way. SMLs such as Med-PaLM, a language model trained on medical data, offers answers to patients and healthcare professionals, while Nvidia has specialised medical computing tools that users can customise.

But while there is hope that AI language models with high-level medical expertise could eventually offer professional diagnoses, the technology is still young and should not be relied upon exclusively.

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We are only just starting to see how AI will transform lives — and society — for the better
Charlotte West, board director, Lenovo Foundation

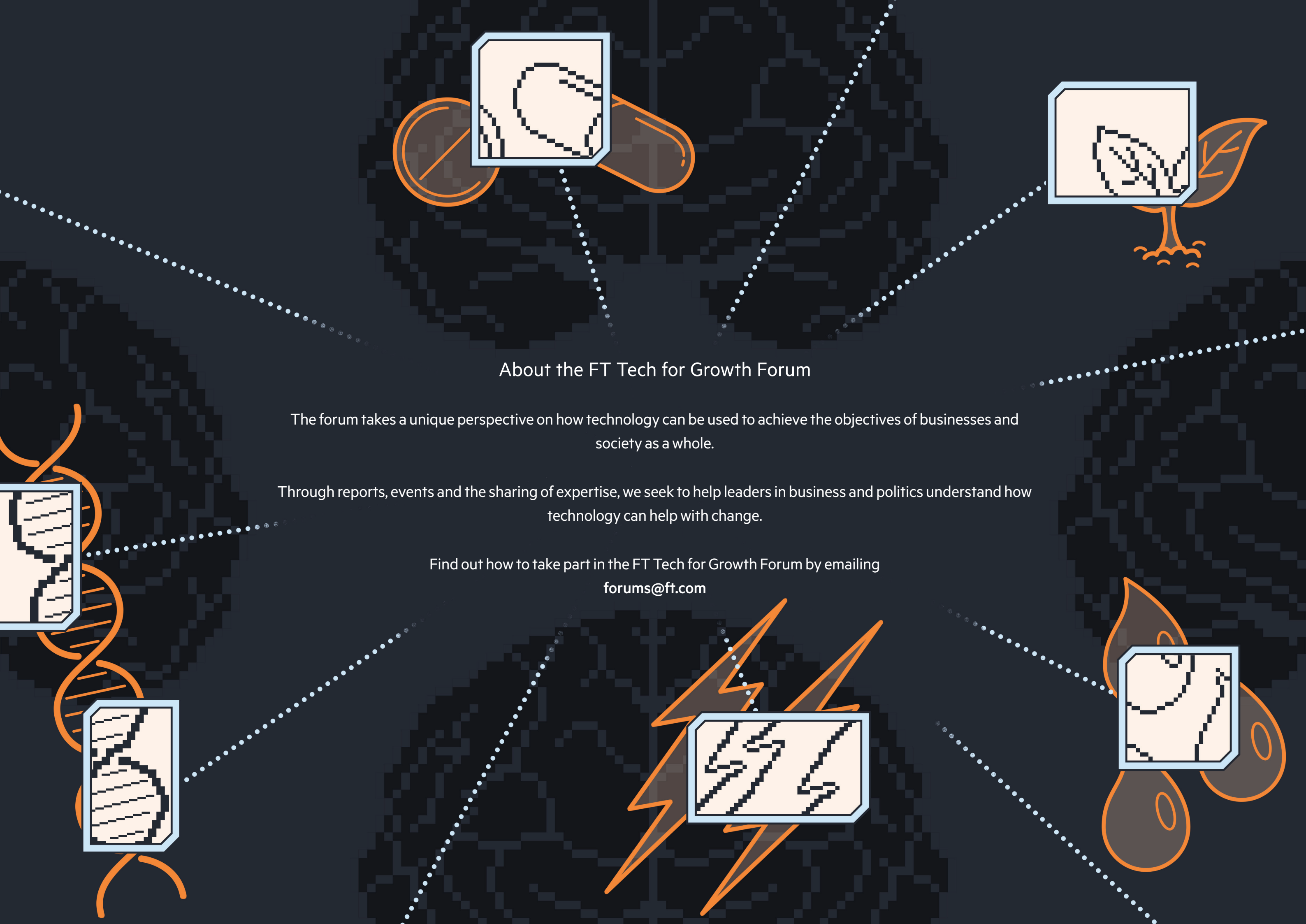
How is AI making a meaningful difference to people's lives? A perfect example is provided by Iomar Barrett, a father of two young children who is living with amyotrophic lateral sclerosis (ALS). Iomar knows that ALS will eventually deprive him of the ability to speak. This means that, until very recently, he would now be contemplating a future in which he is unable to read bedtime stories to his children or sing them lullabies.

But Iomar today can do both of these things through an AI-powered avatar that looks and sounds exactly like him. The proof of concept behind this solution, which builds on years of partnership between Lenovo and assistive-tech pioneer the Scott-Morgan Foundation, works by giving Iomar a specially designed keyboard interface and tracking where he directs his gaze on the screen. Words that he 'selects' through the interface are then spoken by the avatar. The solution, which brings together multiple AI-related technologies, is not only benefiting Iomar and his family but is scalable, meaning it could one day help millions of people otherwise silenced by muscular or neurological conditions.

Heart arrhythmia and dementia are two other conditions that AI is helping to address. In Brazil, 56-year-old Adão was given an unobtrusive wearable device, developed by Lenovo in partnership with the Instituto do Coração cardiology hospital, to monitor his heartbeats and his heart's electrical signals. Using advanced AI, the device can identify potential arrhythmia events, enabling rapid and potentially life-saving interventions. For Adão, this meant doctors could treat him for pulmonary thromboembolism, a serious condition related to the palpitations he recorded while recovering from surgery. Meanwhile, in the UK, people diagnosed with dementia and Alzheimer's can now engage in unscripted, natural conversations with 'Liv', a photoreal 3D avatar that answers their questions by drawing on the lived experiences of a community of hundreds of people living with the condition.

We are only just beginning to see what AI can do for people with long-term conditions. The technology is also levelling the playing field for traditionally under-represented groups, such as by tracking hand movements to provide real-time text and voice translations for people using sign language. It is even enabling people to experience heritage and culture that would otherwise be inaccessible to them, such as the thousand-year-old Yingxian wooden pagoda which is now too fragile for people to visit. Through an extremely lifelike AI-powered digital twin, which is so detailed it captures subtle imperfections in ancient statues, people can now experience this extraordinary structure close up once again.

So, what else is possible? At the Lenovo AI for Social Impact Lab, where we give AI training and resources to climate and education-focused non-profits, we believe technology can help humanity find solutions to its most pressing issues. Our experience is that it's a question of looking at what the technology can do and asking, with a spirit of curiosity and innovation, how it can be adapted to meet the needs of different communities. Often it may be necessary to change course, depending on what the community needs, based on consultations and exploratory conversations. Nonetheless, the potential for good is limitless.



About the FT Tech for Growth Forum

The forum takes a unique perspective on how technology can be used to achieve the objectives of businesses and society as a whole.

Through reports, events and the sharing of expertise, we seek to help leaders in business and politics understand how technology can help with change.

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