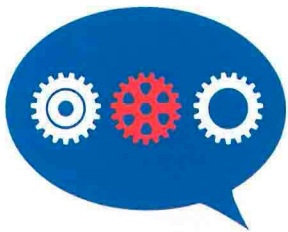# The rise of AI

Artificial intelligence has had a remarkable rise to fame over the last decade, evolving from unsuccessful attempts at creating 'thinking computers' into something that will fundamentally transform our lives for the better

BY LINDSAY JAMES

It was back in the 1950s that English mathematician and World War II codebreaker Alan Turing published his landmark paper speculating about the possibility of creating machines that think. He devised his famous Turing Test whereby if a machine could carry on a conversation that was indistinguishable from a conversation with a human being, then it was reasonable to say that the machine was thinking.

However, it took many decades before Turing's vision became reality. The Turing Test wasn't passed until 2014 and it's only been since then that artificial intelligence has become a realistic possibility.

"Back in the 1980s, many people working the field of AI were trying to program 'smart' machines by building complex sets of rules which mapped out the relationship between some kind of input and some kind of human-like response or decision," explains Abigail Sellen, deputy lab director at the Microsoft Research Lab in Cambridge, UK. These early attempts to create AI or 'expert systems' flailed around for a very long time trying to craft the syntax and semantics of what goes on in a person's head, with little success.

Since then, many of today's breakthroughs can be attributed to developments in machine learning (ML). "ML has evolved as a way of teaching machines, through training with very large datasets, the association between input and output – without teaching these systems specific rules," Sellen adds. "Today, this kind of supervised learning means that we can convert data into intelligence in the sense that these networks can look for patterns or features in the data they are given. Once trained, given a new set of data in the same domain, ML networks can classify it."

According to Chris Miller, chief technology innovation officer at Avanade, we are now at an inflection point where we are seeing a convergence of a number of technologies – including ML – to make some notable advances. "Unlike in the past, today we have vast amounts of data to prove, tune and train the various hypotheses – all supported by a vast amount of computing capability, but without the cost of a super computer. We see this as a 'super convergence' of capabilities."

Using AI to detect tumours

Antonio Criminisi from Microsoft Research in Cambridge has developed an intelligent medical analysis system capable of improving radiation treatment planning for cancer patients. At Microsoft's recent Future Decoded event, Criminisi demonstrated how, using AI, a 3D image of a tumour is created from a normal CT scan and provides assistive analytics to guide treatment planners in creating the best plan to kill cancer cells while protecting healthy cells.

This super convergence has led to advances in a number of areas. "We've seen some jumps in AI across several applications over the last decade," says Eric Horvitz, technical fellow and managing director at the Microsoft Research Centre in Redmond. "It's supercharging productivity in a wide range of business sectors. As machines become more intelligent, they become more capable and reliable partners for daily tasks. Businesses of all sizes, and across multiple sectors, will benefit from machines that can better see, hear, speak and understand. Many of these technologies are still in their infancy, but I'm optimistic about the possibilities."
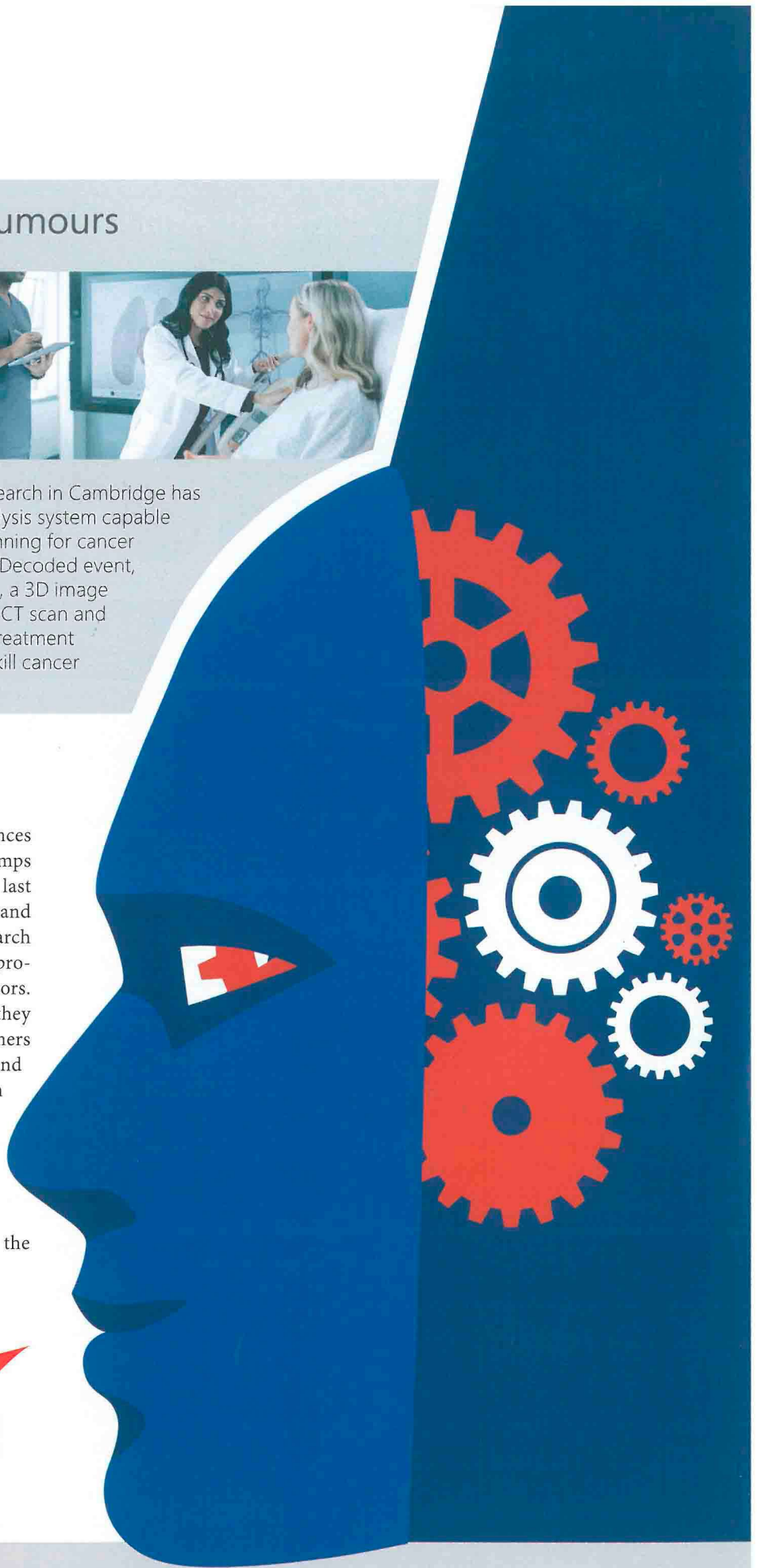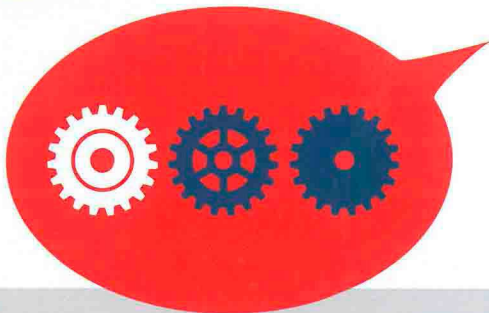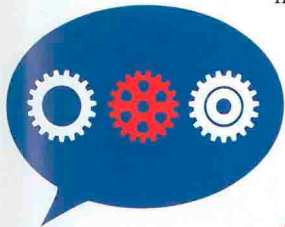
An intelligent media industry

Rick Lievano explains how media companies are already reaping the rewards of AI

While media companies are only just beginning to scratch the surface of what's possible with AI, it's becoming apparent that dramatic business impacts can be achieved now.

For example, with too many video on demand (VOD) choices, today's customers experience confusion and either delay their selection, or reject all choices. MEO, the television, internet, telephone, and mobile package provider, which is part of Portugal Telecom, created a data-driven service to suggest which VOD content that a customer might wish to view.

The results are very impressive. The Microsoft Cognitive Services Recommendations API has helped MEO to take a big step forward in improving its user experience and building more customer

loyalty. VOD consumption has increased dramatically and customers now spend longer engaging in VOD services. And more premium content is being purchased. It's a win: win situation.

Rick Lievano is the worldwide director of industry technology strategy for the Microsoft Telecommunications Sector

Miller says that, for businesses, the new possibilities provide not just an opportunity to automate processes and become more efficient, but to fundamentally change the way they operate. "We expect AI to drive significant business results and, in the next three to four years, be a first-class citizen in the enterprise. For those who remember Star Trek, it is like the computer being everywhere, yet nowhere – it is an invisible revolution."

Products and services are changing too as a result of AI. "We only have to look at the automotive industry to see how AI is providing more intelligent features," says Sellen. "New kinds of services such as personal digital assistants, chat bots and so on are also defining new categories. Robots are changing the world now too. We are already seeing this in manufacturing (car assembly), healthcare (robotic surgery), logistics and autonomous driving, entertainment (theme parks) and surveillance and security (military and remote monitoring)."

However, while AI is a powerful and broadly applicable technology that promises to

transform business, Horvitz is quick to point out that its advances won't replace humans. "As we develop solutions, we need to keep people in mind: there's great opportunity to develop systems that can support and empower people and that can collaborate effectively with them. As we develop new capabilities, we'll also have to continue to work to understand the influences of AI applications on people and

"As machines become more intelligent, they become more capable and reliable partners for daily tasks"

society, and to consider such issues as ethical values encoded in systems that make automated decisions, and the influence of AI on jobs and economics more broadly. As a technology company, we hold the power to design systems that are not only extremely intelligent, but safe, secure, trustworthy, understandable,

Advanced retailing

Microsoft's ShiSh Shridar explains how retailers are turning to AI in an attempt to drive more relevant and personal customer engagement

Retail and consumer goods companies are using AI in a number of ways. For example, they are using chatbots to make personal and relevant recommendations to shoppers. The recommendations are based on shoppers' real-time actions, time of day, location, past purchases, preferences and inferences made from a host of information that the chatbot has access to. Shoppers benefit from having a personal shopper that is tuned to their needs. The increased customer engagement feeds more data to the AI system, enabling it to learn more about the customer and, as a result, become even more accurate in its abilities.

Another important aspect of AI for retail is in its ability to automate processes and therefore improve operational efficiencies. AI systems can be programmed to monitor stock levels and predict overstock and out of stock situations. It can then determine the best course of action for preventing it, well ahead of time. Once the system determines the best course of action, it will initiate the workflow (that could include human approval processes) to execute the promotion.

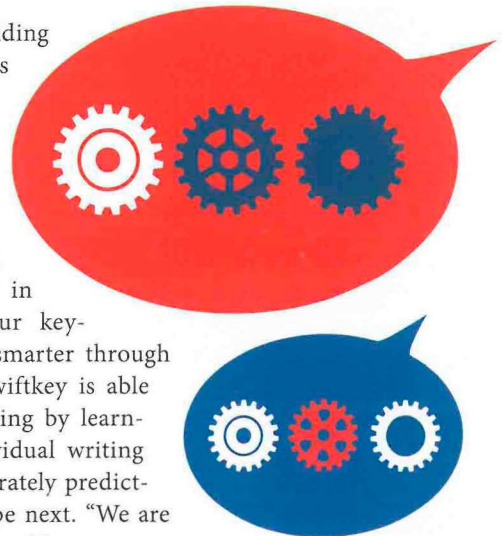*ShiSh Shridar is retail industry solutions director at Microsoft*

videos," Sellen explains. "Other vision-related highlights include Kinect, the fastest-selling consumer electronics device in history at the time of release, which is now having deeper impact through wide use within the research community. And HoloLens, though we've yet to see the full impact of this yet, is an exciting and daring AI innovation that represents the bold, forward thinking of today's Microsoft.

"These intelligent services and more are made available to developers through our Cognitive Application Programming Interfaces (APIs). Since these were launched at Build 2016, we have had more than a billion API calls to these Cognitive APIs. These include APIs for face recognition, image captioning, natural language understanding and a framework that lets people build their own bots. All of this is part of Microsoft's larger ambition to 'democratise AI' – supporting not just developers, but businesses and domain experts in building their own AI tools and services."

Sellen says that more and more of what Microsoft builds as a company will be infused with AI – from building intelligent features for authoring documents, making slide decks in Office 365, helping triage our inbox in Outlook, or mining insights in Power BI. Even our keyboards are getting smarter through neural networks: Swiftkey is able to augment our typing by learning about our individual writing style and more accurately predicting what we will type next. "We are also building the first AI supercomputer by adding FPGAs (field-programmable gate arrays) to our cloud, producing more efficiency and speed, but also flexibility to our computing infrastructure. This approach is more tailored to running deep neural networks using all of the silicon that is available to get performance at scale."

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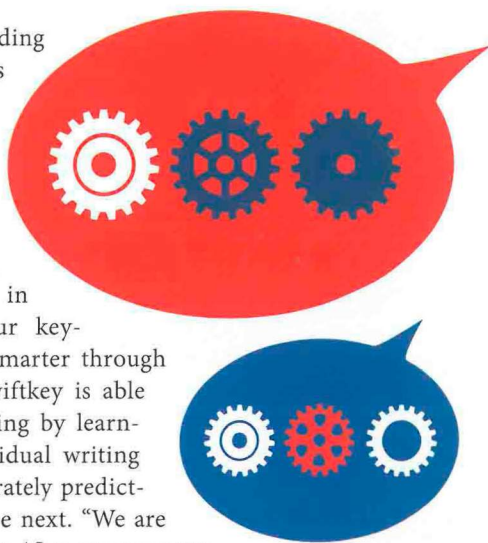*ShiSh Shridar is retail industry solutions director at Microsoft*

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Rolls-Royce: more than a manufacturer

Rolls-Royce is tackling some of the greatest airline operational challenges by using the Microsoft Azure IoT Suite to collect and aggregate data from lots of different sources and Cortana Intelligence Suite to then understand what all this information means. Data sets such as engine health data, air traffic control information, route restrictions and fuel usage data is collected to detect operational anomalies and trends and then provide intelligent performance feedback on the findings. Using Azure Stream Analytics and Microsoft Power BI dashboards, the goal is to uncover data insights that will enable airlines to improve their operational performance and increase fuel efficiency.

"Our customers are looking for ways to leverage the digital landscape to increase efficiency and improve their operations," said Tom Palmer, senior vice president of services for the civil aerospace industry at Rolls-Royce. "By working with Microsoft we can really transform our digital services, supporting customers right across engine-related aircraft operations to make a real difference to performance."

And this is just the start. Widespread adoption of cognitive systems and artificial intelligence (AI) will boost worldwide revenues from nearly US$8.0 billion in 2016 to more than US$47 billion in 2020, according to IDC.

"In the years to come, I see advances continuing in the different areas of AI, including the accuracy of solutions in vision, speech, natural language understanding, reasoning and decision making, and human-AI collaboration," Horvitz says. "Even small advances in accuracy can lead to qualitative jumps in the types of applications and experiences that can be fielded. I think we'll see innovative solutions being constructed via pulling together multiple AI competencies into 'integrative AI' solutions, where systems with more general capabilities will be developed, and that are more human-like in their ability to see, hear, speak and understand situations. I believe we'll see particularly strong successes with AI solutions that are tailored specifically for solving problems in vertical domains. That is, I see a great upside in using general advances in AI and evolving AI tools and platforms to compose solutions to help with specific challenges and operations in such areas as healthcare, transportation, manufacturing and education."

It seems then, that AI could provide huge opportunities for the future. "We can apply AI technology to make driving cars much safer,"

"AI won't just provide new kinds of decision support and automation, it will save lives"

Horvitz concludes. "We can apply machine learning and decision making to such health-care challenges as predicting which patients are at the highest risk for readmission or for acquiring an infection while in the hospital. We can use AI methods to get to grips with how drugs interact, to understand how asthma evolves and affects children – even how to best design a personalised treatment for cancer. AI won't just provide new kinds of decision support and automation, it will save lives." ■