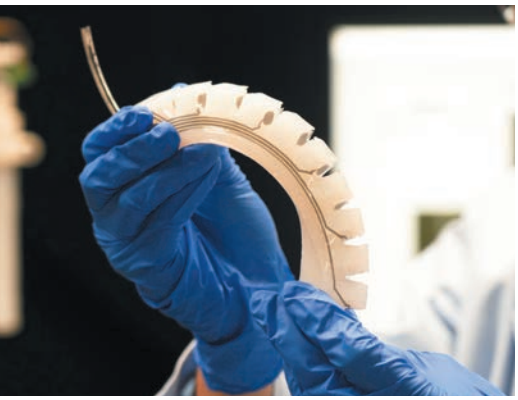

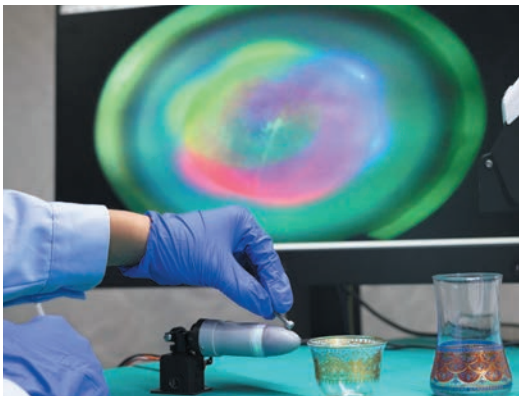

NEW TOOL PROMISES SMARTER APPROACH TO BIG DATA AND AI

The 'DATA ENABLING THEORY AND APPLICATIONS' framework is helping to identify the types of data needed for problem solving with artificial intelligence.

You're stuck in traffic. Most likely, an artificial intelligence (AI) system is aiding the human operators managing traffic-light speed and trying to solve the tangle. But the AI may not recognize or appreciate crucial data points, such as irregular environmental or human-influenced conditions. Enter a new set of tools to improve AIs: data enabling theory and applications (DELTA).

DELTA is a framework of robust mathematical models that can help identify the right data needed to accomplish a goal or task. The framework was devised by Xiao-Ping (Steven) Zhang, a professor of engineering at Tsinghua Shenzhen International Graduate School in China and Toronto Metropolitan University in Canada.

Zhang has an unusual background that has offered him a unique perspective. He undertook a PhD in electronic engineering at Tsinghua University in Beijing and then an MBA at the University of Chicago Booth School of Business in the United States. He has worked as an algorithm engineer in Silicon Valley and a hedge fund investment-strategy researcher on Wall Street.

"My experience in both business and industry meant I often observed that outcomes were probabilistic and ambiguous, with incomplete information, missing data, hidden variables and relationships," he says.

"That enabled me to think outside the box with AI and to challenge fundamental assumptions of causal, stationary and deterministic relationships."

As a result, DELTA applies a combination of signal processing models that analyse and synthesize data, and economic models — such as utility theory, time series evolution analysis, causality analysis and game theory — to account for irregular human and environmental variables.

▲ **Xiao-Ping Zhang's team hope to improve the AI behind Internet of Things-linked devices, such as (above, left–right): soft robots with stretchable sensors, optical-tactile sensors, and unmanned aerial vehicles.**

The DELTA framework can be applied to many different challenges, Zhang says.

"The idea of DELTA is that we want to find the data that will enable the whole information processing chain. This ranges from an acknowledgement of the problem, and clarification of what data are needed, to designing sensors to actively collect those data, and then examining what is required to process the data."

He thinks DELTA could improve outcomes in almost any field or system that relies on AI, including the Internet of Things and the Industrial Internet of Things, and technologies linked to smart cities, intelligent manufacturing and financial institutions, among others.

DELTA also takes into account variables linked to its own processes, such as computing power and energy costs. "It's just a more comprehensive framework to handle the full lifecycle of information and data," Zhang explains. "It will ultimately save on the cost of collecting, storing and processing data not needed for a given problem."

'DELTA' ACCOUNTS FOR IRREGULAR HUMAN AND ENVIRONMENTAL VARIABLES THAT MAY BE AT PLAY.

He says that part of the reason he coined the acronym DELTA is because of the significance of the delta symbol in engineering and mathematics, where it indicates change.

"Right now, we have great power and great tools in terms of static pattern recognition with big data and big models. But this is energy intensive, and we need to refine the whole information processing chain," he says.

"In the past, we focused on searching for patterns in big data, but in future we need to focus on smart data and the correct models and devices." ■

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