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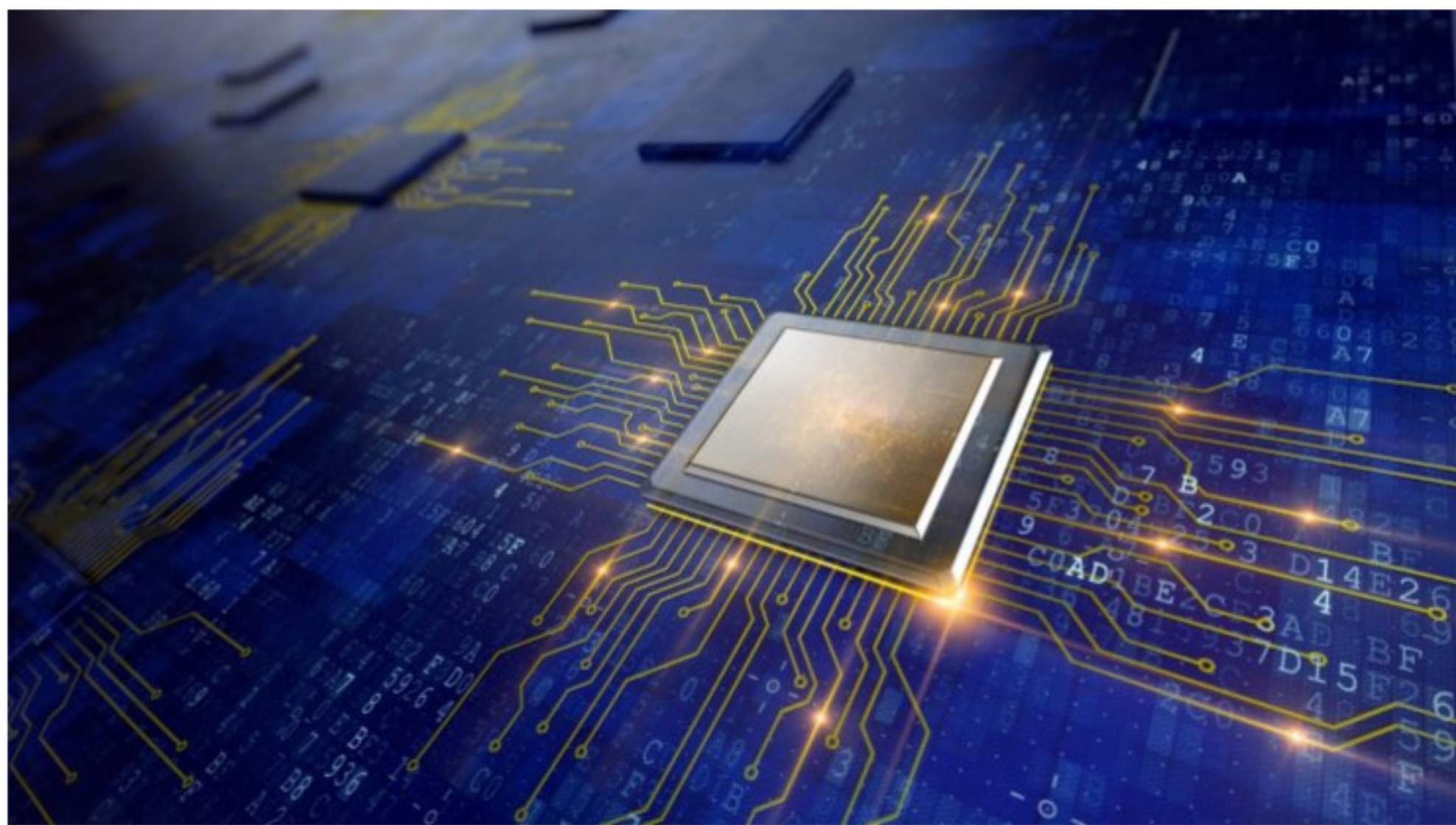
Computer scientists figure out how to get memory chips to act like computer processors

By getting memory chips to perform computing tasks, data could now be processed where it is stored.



By Mary-Ann Russon

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What would life be like if we didn't need processors? Computer scientists have designed a memory chip that is able to process data too, which means potentially faster and thinner devices (iStock)

Computer scientists from Singapore and Germany have developed a new type of memory chip that can act just like a processor to perform computing tasks, which could pave the way for much thinner and faster computers and devices.

Researchers from the Nanyang Technological University in Singapore and RWTH Aachen University and Forschungszentrum Juelich in Germany have developed a new computing circuit using a new super-fast chip technology called Redox-based Resistive Switching Random Access Memory (ReRAM) that is about to be launched commercially around the world.

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ReRAM chips, which have been developed by major chipmakers like Panasonic and SanDisk, have some of the fastest memory modules ever designed, as well as long-term storage capacity, low energy usage and the ability to be produced at a nanoscale value, which makes them very attractive to the semiconducting industry.

But now computer scientists have been able to demonstrate that the ReRAM technology can also be used to process data. This would make the ReRAM chips the first ever memory chips to also be able to carry out computing tasks – usually in a computer, data has to be first transferred from the memory storage to the processor unit to be computed.

Computers today are coded using traditional bits, which is the small unit of data that usually has a single binary value of 0 or 1. So for example, the letter A would be processed in two states and stored in the machine as the 8-bit character "01000001".

"This is like having a long conversation with someone through a tiny translator, which is a time-consuming and effort-intensive process," said Anupam Chattopadhyay, an assistant professor at NTU's School of Computer

Science and Engineering. "We are now able to increase the capacity of the translator, so it can process data more efficiently."

Processing data in four states, rather than two

In the new computing circuit prototype built by the researchers, data is processed in four states, not two, so data can be stored and processed using the values 0, 1, 2 or 3 (known as the Ternary number system) and potentially even more states due to the fact that ReRAM uses different electrical resistance to store information.

If the memory chip itself can process data, then this can save a great deal of time and energy, while boosting the speed of existing processors in mobile devices and laptops by at least two times.

And eventually, if the memory chip can also act as a processor, then you would only need to have a memory chip, so then you could save space and have thinner and lighter devices, which would be useful for the burgeoning wearables industry.

The researchers plan to continue to develop ReRAM technology so that it will in future be able to process data in more than four states, because if this is possible, then computing speeds could truly become lightning fast.

Their research, entitled "Multistate Memristive Tantalum Oxide Devices for Ternary Arithmetic" is published in the open access online journal Scientific Reports.