Q&A

Joelle Pineau

FACEBOOK

Joelle Pineau doesn't want science's reproducibility crisis to come to artificial intelligence (AI). So the machine-learning scientist at McGill University and Facebook in Montreal, Canada, is spearheading a movement to get AI researchers to open their methods and code to scrutiny. She holds a role dedicated to reproducibility on the organizing committee for the Conference on Neural Information Processing Systems (NeurIPS), a major AI meeting. At last month's gathering in Vancouver, Canada, Pineau told *Nature* about the measures the committee put in place.

Why are some algorithms irreproducible?
It's true that with code, you press start and, for the most part, it should do the same thing every time. The challenge can be trying to reproduce a precise set of instructions in machine code from a paper. And then there's the issue that papers don't always give all the detail, or give misleading detail. That's a big issue.

What got you interested in reproducibility?
I fell into it by accident. My students would say 'I can't get these results', or to get the results, they had to do things that I thought were methodologically wrong. It's important to stop it before it becomes the norm.

What reproducibility measures were enacted at NeurIPS this year?
We encouraged people to submit their code; we're running a reproducibility challenge; and we introduced a checklist for papers. The checklist asks, for example, whether you clearly labelled the type of metrics and measures you're using, what the details of your model are and how you set certain aspects of the model that can change the results a lot.

What has the reception been like?
Very good. Code submission is one of the elements I'm most impressed with. A year ago, 50% of accepted NeurIPS papers contained a link to code; this year, it's 75%.

Interview by Elizabeth Gibney
This interview has been edited for length and clarity.

RUSSIA JOINS RACE TO MAKE QUANTUM DREAMS REAL

National initiative aims to build a quantum computer and develop practical technologies.

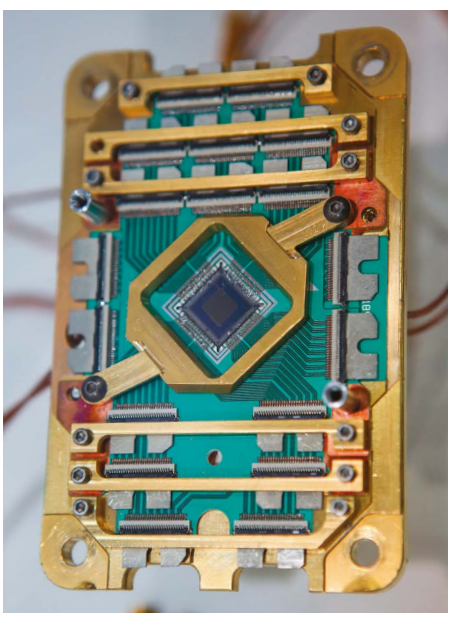
By Quirin Schiermeier

Russia has launched an effort to build a working quantum computer, in a bid to catch up with other countries in the race to develop practical quantum technologies.

The government will inject about 50 billion roubles (US$790 million) over the next 5 years into basic and applied quantum research at leading Russian laboratories, the country's deputy prime minister, Maxim Akimov, announced on 6 December.

"This is a real boost," says Aleksey Fedorov, a quantum physicist at the Russian Quantum Center (RQC), a private research facility in Skolkovo near Moscow. "If things work out as planned, this initiative will be a major step towards bringing Russian quantum science to a world-class standard."

Quantum computers use elementary particles, which can exist in multiple quantum states at once, to carry out calculations. Quantum bits, or qubits, can in theory process information exponentially faster than the binary one–zero bits used in classical computing. Powerful quantum computers could be used to predict the outcomes of chemical reactions, search huge databases or factor large numbers, such as those used in encryption.



CHRISTIAN LADEMANN/ALAMY

A quantum processor with a 2,048-qubit chip.

Quantum technology already receives massive governmental support in a number of countries, including China, the United States and Germany. The European Union's €1-billion (US$1.1-billion) Quantum Flagship programme, first announced in 2016, is expected to produce technology-demonstration projects, such as a quantum processor on a silicon chip, within a few years.

US technology companies are also racing to create quantum computers that outperform classical machines in specific tasks. Prototypes developed by Google and IBM, for example, are becoming as capable as classical computers. In October, scientists at Google announced that a quantum processor working on a specific calculation had achieved such a quantum advantage. Russia is "five to ten years behind" other countries, says Fedorov. "But there's a lot of potential here."

Poor funding has excluded Russian quantum scientists from competing with Google, says Ilya Besedin, an engineer at the National University of Science and Technology in Moscow. The national quantum initiative might help to turn this around, he says.

"No one is close to the quantum-computing capacity that would be required for practical applications," says Besedin. "We're all looking for new avenues to explore. With serious government support, this is going to become a very interesting research opportunity."

Home-grown qubits

The initiative comes as quantum science in Russia begins to recover from the departure, in the 1990s and 2000s, of top researchers who left for better salaries and funding opportunities. Several Russian quantum physicists working abroad are on the RQC's international advisory board. Others, including Alexey Ustinov, a condensed-matter physicist at the Karlsruhe Institute of Technology in Germany, have received grants from the Russian government to set up research groups in Russia.

And scientists in Russia are already developing their own approaches to building large-scale quantum computers, says Ustinov. "The initiative is a promising start to increase the level of quantum research in Russia," he says. "We will see where this will lead."