World view

By Jim Portegies

How to prevent AI from harming mathematics

Mathematicians must urgently recognize AI's impacts on their field — and act swiftly to mitigate threats.

Science as we know it is under threat from rapid developments in artificial intelligence. Generative AI is fuelling a rise in submissions of low-quality research papers written with the help of chatbots. And technology companies control the most powerful models. With investments in AI for science accelerating, it might not be long until tech firms effectively shape the questions that researchers ask.

Mathematics is particularly affected, because the discipline lies at the heart of AI systems. The work of many maths researchers also spills into ethical territory. AI models can be used for warfare or mass surveillance and to fuel political disturbances. AI use also affects the environment through the systems' demand for energy and water.

This is why, with 15 colleagues, I wrote the Leiden Declaration on Artificial Intelligence and Mathematics. It calls on all mathematicians — as individuals and as a community — to ensure that the integration of AI into the field brings benefits, not irrevocable harm. AI should speed up processes or help researchers to gain insights; it should not erase expertise, create rifts in the community or weaken the educational system. The declaration was published on 2 June. Since then, it has been signed by roughly 3,000 scientists, most of whom are research mathematicians, and attracted interest from mathematical organizations and the press.

Even so, I think many community members do not grasp the urgency. Mathematician Terence Tao, who received the 2006 Fields Medal, stated in his endorsement of the declaration that the community should have started discussing AI's implications years ago. Others agree.

The declaration is the result of a September 2025 workshop in Leiden, the Netherlands, that brought together around 60 mathematicians, computer scientists, historians, philosophers and social scientists to discuss the mechanization of mathematical research.

All participants agreed that action is needed urgently, despite having a range of views and predictions about what AI might mean for the discipline. I was part of a representative group of 16 delegates who worked on charting a course for the field.

The declaration identifies core values of mathematics: transparency, scientific integrity and proper attribution of previous work by situating new research in existing literature. It sets out merit-based standards: the ability to learn and work in mathematics on the basis of skills, rather than any form of privilege. And it emphasizes autonomy: as a community, mathematicians should have a large say in the field's direction.

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The document calls on mathematicians to ensure that their work is correct, adhere to open science and provide enough information so that manuscripts can be reviewed thoroughly. They should insist on human authorship and disclose AI use. And they should make informed ethical decisions regarding which tools to use and whether to collaborate with industry.

The core values of mathematics are under strain. The reliance on technologies owned by private companies might restrict mathematical research to scientists who have some decision-making power regarding the systems used or who, at least, have access to the models. Another issue is that when AI companies announce results in blog posts or press releases rather than as peer-reviewed articles — without sharing much information about how the models were trained — they harm open science and encourage hype.

We call on the mathematical and other communities to mitigate these threats. Academic associations, funding agencies and publishers must build expertise in AI for science. Validation by the mathematical community, through peer review for example, must be a key part of accepting scientific advances. Grant-application reviews should assess whether a proposal is aligned with scientific values.

Mathematicians must engage in and bring a scientific perspective to debates, such as those suggesting that mathematics will be solved by AI and that advances in AI for mathematics will lead to artificial general intelligence. Such unfounded claims not only capture people's attention but can also generate public anxiety through premature speculation. But no speculation is needed to see the threats posed by current AI technologies.

Mathematics is more than problem solving and competition, and the role of AI in some aspects of the field remains unclear. Progress, including AI's ability to solve the long-standing problems formulated by twentieth-century mathematician Paul Erdős, is interesting scientifically. But equally important are the development of mathematical insights, the search for alternative explanations for known results, information transfer, the development of theories and the building of connections within and between disciplines and with the wider world.

The threats posed by AI go beyond mathematics. Mathematicians need to cooperate with other academics, professionals, funders, governments and international institutions. Policymakers should legally protect authors' rights, look to scientists to interpret results and deflate the hype, invest in public infrastructure and regulate the AI industry. Education and science policy also need attention.

Only a coordinated effort by mathematicians and others can protect science's autonomy, openness and reliability.

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