Institute for Computer-Aided Reasoning in Mathematics

Annual Report

Year One

Covering activity between September 1, 2025 and August 31, 2026

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Carnegie Mellon University

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Overview

Mission

New computational technologies that support mathematical reasoning are changing how mathematics can be done. These include interactive theorem proving and formalization, automated reasoning and symbolic artificial intelligence, and machine learning and neural artificial intelligence. The phrase "AI for mathematics" now encompasses all of these and more. In 2023, a workshop convened by the National Academies of Sciences, Engineering, and Medicine explored both the promise of these technologies and the challenges that lie ahead. The Institute for Computer-Aided Reasoning in Mathematics was established to meet the challenges and help realize the promise.

The mission of ICARM is to:

- empower mathematicians to take advantage of new technologies for mathematical reasoning, and keep mathematics central to everything we do;
- unite mathematicians of all kinds, computer scientists, students, and researchers to achieve that goal; and
- ensure that mathematics and the new technologies are accessible to everyone.

The first commitment reflects the fact that not only is AI a valuable resource for mathematics, but also, even more importantly, mathematics is key to the effective use of AI today. ICARM proceeds from the conviction that mathematicians should be leaders in the use of these tools rather than mere consumers, and that the mathematical community should have a hand in shaping technologies that will have an impact on their discipline and beyond.

The second commitment reflects the fact that no one community can meet the challenges alone. Progress requires mathematicians, computer scientists, engineers, students, and researchers in industry to work together. ICARM is dedicated to bringing these groups together and fostering interaction and collaboration.

The third commitment recognizes that these technologies can either broaden access to mathematics or narrow it: the digitization of mathematics can make the subject more widely available than it has ever been, but it can also concentrate the ability to do mathematics among those with access to expensive computational resources and specialized expertise. ICARM works to ensure that the resources needed to participate, including tools, documentation, training, and infrastructure, are accessible to a wide audience.

Activities

ICARM is one of seven Mathematical Sciences Research Institutes supported by the National Science Foundation to serve as national resources for the mathematics research community. Like the other institutes, ICARM is a place where people can come together to share ideas and collaborate, in workshops, summer schools, conferences, and visits. A novel aspect of ICARM is that we also maintain a permanent technical staff of *innovation engineers* who support mathematicians in the use of the new technologies, and who build and maintain shared resources

for the community. We and our innovation engineers work closely with the other MSRIs, as well as other institutes, to support activities at other sites that are related to our mission.

We encourage workshops that follow the project-based model pioneered by the American Institute of Mathematics, in which participants propose problems and work on them in small groups. We also host summer schools, which train PhD students in the use of the new technologies, and focused meetings convened to address timely topics and questions. We seek meetings that bring together researchers with different types of expertise, as well as junior and more senior researchers. We also encourage meetings that bring researchers with experience using the new technologies with researchers who are not familiar with them but interested in learning more. The four meetings held during the first year are described under Meetings below.

We also contribute to meetings organized by others, outside of ICARM. We send staff to provide technical assistance at other institutes' workshops, organize special sessions and tutorials at conferences, sponsor lectures, and maintain a presence at the large annual meetings of the profession. These are described under Off-Site Activities below.

In our second year, we will host our first collaborative visits. As with our workshops, we especially encourage collaborations between people with different backgrounds and types of expertise. Visitors are supported by our innovation engineers. At the end of our second year, we will launch an annual conference on computer-aided reasoning.

Finally, the institute builds and maintains resources for the community. Its innovation engineers develop databases, benchmarks, tutorials, documentation, and software infrastructure, and assist mathematicians directly in the use of proof assistants, automated reasoning tools, and machine learning methods. These are described under Resources and Innovation Engineering below.

In our second year, we will begin to offer postdoctoral fellowships to support young researchers whose work makes use of or relates to new technologies for mathematical reasoning. In lieu of teaching duties, we ask our postdocs to support the institute's mission in a manner like our innovation engineers, participating in and preparing materials for workshops, assisting other mathematicians in their technology-related projects, and preparing and curating resources for the mathematics community.

Operations

ICARM is hosted by Carnegie Mellon University, which provides its infrastructure, space, human resources, and legal and financial oversight. Those aspects of ICARM are governed by a University Oversight Board which meets annually. Administratively, ICARM is situated under Carnegie Mellon's Office of the Vice President for Research.

For decisions related to its scientific and educational mission, ICARM answers to a Scientific Advisory Board and an Educational Advisory Board. ICARM solicits proposals for meetings, summer schools, and collaborative visits on its web page; proposals are reviewed and approved by these boards. The directors meet with them virtually twice annually, once in the fall and once in the spring, but also maintain constant contact on a social media channel. The latter plays a crucial role since the institute is young and needs to make programming decisions with a faster

turnaround than more mature institutes. Finally, ICARM maintains a Strategic Advisory Board consisting of leaders in academia, industry, and the public domain, and meets with members on an ad-hoc basis, as their advice is needed. Our advisory boards and their descriptions are described under People.

On a day-to-day basis, ICARM is run by its director (Jeremy Avigad), its associate director (Matthew Ballard), and a senior administrative coordinator (Jennifer Agnew). We currently have three innovation engineers: Blake Jackson, Aayush Rajasekaran, and David Renshaw. We are supported by several assistant directors, enumerated under Leadership.

The director and associate director take part in the regular meetings of the directors of the NSF mathematical sciences institutes. These meetings coordinate activity across the institutes and are a channel through which a new institute learns from established ones. The minutes of the main meeting, held at ICERM in April 2026, are submitted separately.

Facilities and Information Technology

ICARM is housed in the Robert Mehrabian Collaborative Innovation Center at Carnegie Mellon University, which includes offices for staff and visitors, two small meeting rooms, a large common area suitable for collaborative work, and a reception area with kitchen. The university is renovating an adjacent room that can be used for meetings of up to thirty-five to forty people. The institute will rely on campus rooms for larger meetings, as it did for all four of the meetings it held during the first year.

The institute maintains its web site at icarm.io, as well as a mailing list, a GitHub organization, a Zulip social media server, various social media accounts, AWS servers for its databases and web pages, with other resources hosted on CloudFlare. We have developed web infrastructure that allows users to create accounts and register for meetings. We also maintain a working relationship with the Pittsburgh Supercomputing Center and can help connect mathematicians to their resources.

Evaluation

Two forms of evaluation were in place by the end of the first year. Participants at ICARM meetings are asked to complete a feedback survey covering the scientific value of the event, its level and preparation, the opportunities it created, and the assistance provided by the innovation engineers; organizers are asked for a final report on the event's structure, outcomes, and expected outputs. Both were introduced partway through the year and are now standard practice, and the results are summarized in the meeting sections below.

The institute is still working to develop means of evaluating the use of the resources it builds, including databases, leaderboards, and software. Acknowledgments of their use in publications are one important measure of their impact, but not the only one possible.

External and In-Kind Support

Two of the institute's first-year meetings were held at very little cost to the award. Milestones of Autonomous Mathematics was organized jointly with Principia Labs, which hosted the workshop in San Francisco and covered its costs. Similarly, PIs in the NSF AIMing program were required to fund their own travel expenses for the AIMing PI meeting, and a supplementary NSF grant funded additional project participants, students, and colleagues.

Overview of First Year

The first year of the institute was largely a year of construction: hiring staff, occupying our space, introducing ourselves to the mathematics community, building a web presence, constituting advisory boards, and building infrastructure to run our first meetings. Funding was awarded at the very end of July 2025, leaving scant time to prepare. Our first innovation engineer, David Renshaw, started on October 29; Jennifer Agnew began as Senior Administrative Coordinator on February 9; our remaining innovation engineers, Aayush Rajasekaran and Blake Jackson, began on July 13 and August 3, respectively. ICARM nonetheless held four meetings, contributed to seven meetings organized by others, and began the resource-building work described below.

Our initial advisory boards were constituted and first met in the fall, and the institute took control of its space in late 2025 and began to settle in and make it a home. We launched our web pages and established a Zulip social media server that has since become the institute's principal medium for administration, advisory board discussion, meeting organization, community discussion, and continuing research conversations.

ICARM’s first activity was a joint workshop with SLMath, Lean for PDEs, held in Berkeley in October 2025, two months into the award. In January the institute introduced itself to the mathematical community at large at the Joint Mathematics Meetings, with a booth in the exposition hall, a two-part tutorial on automated reasoning, and participation in the mathematical institutes open house.

The institute’s own meetings began in the spring. The NSF AIMing PI Meeting in April brought together the investigators of the NSF AI for Mathematical Reasoning program and served as a rehearsal for the larger meetings that followed. Milestones of Autonomous Mathematics, held jointly with Principia Labs in San Francisco later the same month, convened mathematicians to define benchmarks for progress in AI-assisted mathematics. In the Workshop on Algebraic Geometry and Machine Learning in June, participants proposed problems on the first day and pursued them in working groups through the week. The Summer School on Formalization of Mathematics in July trained students in the use of the Lean proof assistant over two weeks of lectures, exercise sessions, and independent projects, and has already produced contributions to Mathlib.

In addition to these these, ICARM contributed to several meetings organized by others: co-organizing the SLMath workshop, presenting the tutorial and staffing the booth at the Joint Mathematics Meetings, taking part in an AI-and-mathematics meeting in Aarhus, sending innovation engineers to provide technical assistance at a workshop at the American Institute of

Mathematics, sponsoring a plenary lecture and tutorial at an International Congress of Mathematicians satellite conference, organizing a special session at the International Congress on Mathematical Software, and taking part in AIM's REUF program for researchers from undergraduate faculty. The innovation engineers, meanwhile, supported the institute's own meetings and began building shared resources for the community, including a matroid database, a leaderboard of elliptic curve ranks, a database arising from the Equational Theories Project, and assistance with the formalization of the sphere packing theorem in dimension eight.

The table below lists the institute's activities during the reporting period.

Dates	Activity	Location	Type	Participants
Oct 6–9, 2025	Lean for PDEs (with SLMath)	Berkeley, CA	Contribution	—
Jan 4–7, 2026	Joint Mathematics Meetings: booth, tutorial, and institutes open house	Washington, DC	Contribution	—
Jan 27–30, 2026	AI and mathematics meeting, Aarhus University	Aarhus, Denmark	Contribution	—
Apr 2–3, 2026	NSF AIMing PI Meeting	Pittsburgh, PA	ICARM meeting	28
Apr 13–15, 2026	Milestones of Autonomous Mathematics (with Principia Labs)	San Francisco, CA	ICARM meeting	37
May 27–30, 2026	AI and Number Theory at AIM	Pasadena, CA	Contribution	—
Jun 22–26, 2026	Workshop on Algebraic Geometry and Machine Learning	Pittsburgh, PA	ICARM meeting	39
Jul 7–17, 2026	Summer School on Formalization of Mathematics	Pittsburgh, PA	ICARM meeting	41
Jul 20–21, 2026	Exploring Constructions in Mathematics Using AI Tools	Pittsburgh, PA	Contribution	—
Jul 23, 2026	Mathematics in Lean, special session at ICMS 2026	Waterloo, ON	Contribution	—
Jul 27–31, 2026	Research Experiences for Undergraduate Faculty at AIM	Pasadena, CA	Contribution	—

The sections that follow provide further detail about our meetings and activities.

Meetings

ICARM held four full meetings during the first year of the award. The NSF AIMing PI Meeting brought together the investigators of the NSF AI for Mathematical Reasoning program; Milestones of Autonomous Mathematics, held jointly with Principia Labs, convened mathematicians to define benchmarks for progress in AI-assisted mathematics; the Workshop on Algebraic Geometry and Machine Learning applied machine learning to discovery in algebraic geometry; and the Summer School on Formalization of Mathematics trained students in the use of the Lean proof assistant. Together the four meetings drew 145 participants — 136 distinct people, several of whom attended more than one — from seventy institutions in nine countries,

with $96,085 in participant support from the award. Participant figures throughout this report are taken from the institute's NSF participant data and exclude ICARM staff and NSF program officers.

NSF AIMing PI Meeting

April 2–3, 2026 · Robert Mehrabian Collaborative Innovation Center, Carnegie Mellon University, Pittsburgh, PA

The NSF AIMing PI Meeting was the first meeting of the investigators of the NSF AI for Mathematical Reasoning (AIMing) program, which supports research at the intersection of artificial intelligence and mathematical reasoning. ICARM hosted the meeting at its home in the Robert Mehrabian Collaborative Innovation Center at Carnegie Mellon University. Over two days, the investigators presented their projects to one another and to the NSF program officers, identified common problems and opportunities for collaboration, and discussed the direction of the program as a whole.

Participation

Participants	28
Institutions represented	11
Non-U.S. institutions	2 participants (Canada)
Career stage	15 faculty, 10 graduate students, 3 postdoctoral associates
Participants receiving NSF support	8
Total NSF participant support	$6,855.64

Participants came from Brown University, Carnegie Mellon University, Clemson University, Colorado College, Duke University, Harvard University, New York University, Simon Fraser University, Stanford University, the University of California, Davis, and the University of California, Santa Cruz. Three NSF program officers and two members of the ICARM staff also took part; following the convention used throughout this report, they are not included in the counts above.

ICARM did not administer a participant feedback survey for this meeting.

One paper has already come out of discussions held at the meeting. In "There are matroid toric ideals without quadratic Gröbner bases," Jesús A. De Loera, Luis Ferroni, Santiago Morales, and Jörg Rambau show that matroids containing the Fano plane as a minor have no quadratic Gröbner basis, by relating the question to the absence of regular unimodular flag triangulations of their base polytopes. De Loera and Morales both took part in the PI meeting, and the paper thanks Marijn Heule, ICARM's Assistant Director for Scientific Activities, for "inspiring exchanges."

Milestones of Autonomous Mathematics

April 13–15, 2026 · Pebblebed, San Francisco, CA · A joint ICARM and Principia Labs workshop

Recent progress in mathematical AI models has led to a surge of discussion and excitement, but mathematicians have had limited input into the narratives that surround these technologies. This workshop convened mathematicians from both academia and leading labs to establish benchmarks for progress in AI-assisted mathematics: to develop a list of milestones marking levels of progress in each of roughly eight categories of assistance or reasoning that a mathematical AI might provide to researchers. Anticipated categories included problem solving, generalization, exposition, formalization, and conjecturing, with the final list to be settled by the participants on the first day. The organizers' premise was that mathematicians themselves should define what meaningful progress looks like, both to counter hype-driven accounts of the field and to identify the capabilities that would genuinely benefit mathematical research.

The workshop was organized on short notice in partnership with Principia Labs, which hosted and sponsored the meeting in San Francisco. It drew a mix of academic mathematicians and researchers from corporate laboratories, with mathematicians in the majority.

Organizers

- Elliot Glazer, Principia Labs
- Alex Kontorovich, Rutgers University
- Daniel Litt, University of Toronto
- Jacob Tsimerman, University of Toronto
- Ravi Vakil, Stanford University

Participation

Participants	37, including 5 organizers
Institutions represented	27
Non-U.S. institutions	8 participants (Australia, Canada, Denmark, Switzerland, the United Kingdom)
Career stage	22 faculty, 7 in industry or other non-academic employment, 5 graduate students, 3 postdoctoral associates
Participants receiving NSF support	none
Total NSF participant support	$0 (Principia Labs met the costs of the meeting)

As with the PI meeting, no participant feedback survey was administered for this workshop; ICARM introduced surveys for the meetings it held later in the year. Elliot Glazer is coordinating with the organizers to prepare a document compiling the results of the discussions.

Workshop on Algebraic Geometry and Machine Learning

June 22–26, 2026 · Robert Mehrabian Collaborative Innovation Center, Carnegie Mellon University, Pittsburgh, PA

Recent advances in machine learning, particularly large language models, automated theorem discovery, and AI-assisted symbolic computation, promise to significantly influence the practice of pure mathematics. This workshop explored the intersection of algebraic geometry and machine learning, with a central emphasis on the systematic search for patterns in mathematical data as a pathway to formulating precise conjectures and proofs in algebraic geometry.

Rather than a traditional program of lectures, the workshop followed a mathematical hackathon model of the kind pioneered by the American Institute of Mathematics: participants proposed research problems on the first day and then organized themselves into working groups that pursued those problems through the rest of the week. The program also included tutorial sessions introducing algebraic geometers to modern machine learning tools, covering effective prompt engineering for large language models, the differences between current model architectures and their capabilities, and specialized tools for mathematical discovery. The week closed with a general discussion of the role of AI in mathematical research.

Organizers

- Matt Baker, Georgia Institute of Technology
- Jennifer Balakrishnan, Boston University
- François Charton, Axiom Math
- Amaury Hayat, École des Ponts ParisTech
- Andrew Sutherland, Massachusetts Institute of Technology

Participation

Participants	39, including 5 organizers
Institutions represented	28
Non-U.S. institutions	7 participants (Canada, Denmark, France, the Netherlands, Switzerland)
Career stage	23 faculty, 7 postdoctoral associates, 5 graduate students, 2 in non-academic employment, 1 retired, 1 high school student
Participants receiving NSF support	24
Total NSF participant support	$36,958.45

The workshop drew a broad range of institutions, from research universities in the United States and abroad — among them Georgia Tech, MIT, Princeton, Stanford, UCLA, the University of Michigan, the University of Washington, Aarhus University, the École Normale Supérieure, Universiteit Leiden, the University of British Columbia, McMaster University, and the University of Toronto — to liberal arts colleges, including Lafayette College, and a local high school student from North Allegheny High School.

Program

The workshop opened on June 22 with a problem session in which participants proposed questions they hoped machine learning and AI tools might help them attack. The problems ranged widely across algebraic geometry, arithmetic geometry, and combinatorics, and the collected proposals were circulated as a written document that remains a useful record of what

the field currently regards as approachable. Ten working groups formed out of that session and worked through the week:

- Inverse Galois: a verified database of smooth cubic surfaces over the rationals realizing specified subgroups of W(E6) as the Galois action on their 27 lines;
- How to Train Your Model: whether a machine learning model can be trained to infer the definition of intersection number;
- Planar Central Configurations: clarifying computer-assisted algorithms for classifying equal-mass planar central configurations;
- Hartshorne's Conjecture: on smooth projective m-folds in projective n-space as scheme-theoretic complete intersections;
- Cross-Ratio Degrees: counting configurations of labeled points on the projective line with prescribed generic cross-ratios;
- Elliptic Curves of Large Rank: searching for curves of rank at least 12 with unusually small conductor, discriminant, or height;
- Ehrhart Theory of Matroids: testing which properties of h*-vectors transfer from lattice polytopes to matroids;
- Completely Decomposable Jacobians: which genera admit curves whose Jacobians are isogenous to products of elliptic curves;
- Ceresa Cycles: whether non-hyperelliptic curves of arbitrarily large genus can have vanishing Ceresa cycle;
- Brill–Noether Theory for Graphs: existence and gonality bounds for divisors on graphs by combinatorial means.

Groups reported on their progress each day. Interspersed with the working sessions were lectures — a talk by Mohammed Abouzaid was singled out repeatedly in the feedback — and tutorial sessions on machine learning tools, including a demonstration of AlphaEvolve by ICARM innovation engineer David Renshaw and a talk of his on finite magmas. Participants were given access to AlphaEvolve for the week. The workshop closed with a panel discussion on how mathematicians should respond to AI, which participants mentioned as a highlight nearly as often as their own projects.

Reception and Outcomes

Twenty-two of the thirty-nine participants completed the feedback survey. On a five-point scale they rated the workshop 4.8 for intellectual stimulation, 4.8 for being worthwhile overall, 4.8 for increasing their interest in the subject, 4.8 for being pitched at an appropriate level, 4.7 for helping them meet people with related interests, and 4.9 for the professionalism of the environment; the lowest rating, 4.6, was for whether participants felt well prepared to benefit, which is unsurprising for a workshop that deliberately brought algebraic geometers with no experience of machine learning together with practitioners.

The AIM-style format drew the strongest comments. Participants valued the combination of expert practitioners and working mathematicians in one room and the license to ask elementary questions of the experts; one wrote that after identifying a suitable problem, the group “solved a problem in a day or so that would probably have taken months without AI,” and several reported that the week changed how they will use these tools in their own research and in the training of their students. Suggestions for improvement were practical: send the schedule and arrange access

to tools further in advance, provide more hands-on tutorial practice on small problems, and install blackboards in the downstairs working space.

Multiple participants praised innovation engineer David Renshaw's contribution with one adding "David Renshaw was a great supporter of the workshop. His talk on finite magmas, together with his innovative ideas for creating new community challenge websites, was truly inspiring, and generated many discussions." For future workshops, participants suggested more clearly advertising early who the engineers are, what their roles, and what they can help with.

Concrete outcomes were reported within weeks. The cubic surfaces group produced a dataset, now public at https://github.com/AndrewVSutherland2/CubicSurfaces, which is to be described in a forthcoming paper. Participants reported at least two new collaborations apiece in several cases, with preprints expected from the Brill–Noether, cubic surfaces, and central configurations groups among others; one participant began a new research direction on the mathematics of mechanistic interpretability, and another initiated projects on finite magmas and on foundation models for polyhedral geometry. Two participants intend to incorporate what they learned into grant proposals. The workshop also generated a proposal for a future ICARM workshop on matroids and computation, and advanced the matroid database project that ICARM's innovation engineers were already supporting.

Summer School on Formalization of Mathematics

July 7–17, 2026 · Robert Mehrabian Collaborative Innovation Center, Carnegie Mellon University, Pittsburgh, PA

Computational proof assistants now make it possible to develop global, digital mathematical libraries with theorems that are fully checked by computer. This two-week summer school introduced students to computational proof assistants and formalized mathematics, with the goal of equipping them to formalize mathematics on their own and to contribute to Mathlib, the Lean community's mathematical library. Applicants were expected to have completed at least one undergraduate course in computer programming and to arrive with a mathematical topic of their own in mind for a formalization project.

The curriculum combined short lectures with extended hands-on sessions. The first day covered an overview of the technology and installation of Lean; the first week paired lectures on the theory and practice of formalization with supervised exercise sessions; and the second week added small-group independent projects, in which students formalized mathematics of their own choosing with the help of the instructors and teaching assistants. Optional tutorials on metaprogramming taught students to write custom Lean tactics and develop their own automation.

Organizers

- Bhavik Mehta, Imperial College London
- Rob Lewis, Brown University

Participation

Participants	41, including 2 organizers

Institutions represented	23
Non-U.S. institutions	8 participants (Canada, France, the Netherlands, South Korea, the United Kingdom)
Career stage	32 graduate students, 2 faculty, 2 postdoctoral associates, 1 undergraduate, 1 high school student, and 2 others
Participants receiving NSF support	30
Travel support	$11,830.64
Housing (dormitory) support	$26,686.40
Total NSF participant support	$52,270.53

Students came from twenty-three institutions, including Amherst College, Brown University, Carnegie Mellon University, Indiana University, McMaster University, Northeastern University, the Ohio State University, Rutgers University, the University of Cambridge, the University of California, Davis, the University of Chicago, the University of Illinois, the University of Maryland, the University of South Carolina, the University of Texas at Austin, the University of Wisconsin–Madison, Western University, Yonsei University, and Inria, as well as a local high school student from North Allegheny High School. ICARM covered dormitory housing for twenty-seven students, which made the school accessible to students without travel funding of their own.

Program

In the first week, students attended two lecture sessions a day, each followed by exercise time in which they worked through problems from the text *Mathematics in Lean*. In the second week, a single daily lecture was paired with a research talk, and afternoons were given over to group project work, with final presentations on the last day. Three optional sessions on Lean metaprogramming ran alongside the main program, several of them presented by the teaching assistants. The organizers discouraged the use of large language models to generate code during the first week, so that students would learn to write Lean themselves; some explored those tools in the second week.

ICARM's innovation engineers Aayush Rajasekaran and David Renshaw mentored the student projects, advising both on Lean and Mathlib specifics and on ordinary software infrastructure, setting up GitHub projects, and the like. The organizers described their contribution as invaluable, and students singled them out in the survey.

Reception and Outcomes

Nine participants completed the feedback survey. On a five-point scale they rated the school 4.9 for being worthwhile overall, 4.8 for intellectual stimulation, 4.6 for being pitched at an appropriate level, 4.6 for increasing their interest in the subject, 4.3 for helping them meet people with related interests, and 5.0 — unanimously — for the professionalism and respectfulness of the environment. The one modest score, 3.9, was for whether participants felt well prepared to benefit from the lectures, which matches the written comments: for many students this was a first encounter with Lean, and the pace of the first week was demanding.

What students valued most was direct access to expert formalizers and the freedom to ask elementary questions. One wrote of the interactive problem sessions that “I am new to Lean and not once did I feel that I did not belong.” Another observed that the school assembled several of the leading contributors to the Lean community, an opportunity that would have been difficult to obtain otherwise. Teaching assistants reported benefits of their own, in expository practice and in understanding how mathematicians new to proof assistants think.

The suggestions were consistent and easy to act on. Several students wanted the group projects to begin earlier — the first days of a project are spent understanding the mathematics, leaving less time for formalization — and better balance in the second week between learning to write Lean and letting more experienced group members write it. Both the organizers and the students recommended an informal evening or weekend gathering to encourage camaraderie among a group of students inclined to keep to themselves.

At least two pending computations (pull requests) to Mathlib have already resulted from the school, with more expected from the second-week projects. One student's project on the formalization of polytopes continues, and will take them to a follow-on event at the Freie Universität Berlin; other groups intend to submit their work to Mathlib. The organizers plan to ask several students to write about the school for the Lean community blog, and one teaching assistant's metaprogramming materials will be reused for future teaching.

Off-Site Activities

In addition to hosting meetings in its space, ICARM’s leadership and staff contribute to other meetings to support its mission. This section describes some of those activities over the past year.

Lean for PDEs

October 6–9, 2025 · Simons Laufer Mathematical Sciences Institute, Berkeley, CA

ICARM's first activity of any kind was a joint workshop with SLMath, held in Berkeley during SLMath's semester program and offered online as well as in person. The workshop was devoted to using the Lean proof assistant to formalize partial differential equations and to contribute to the PDE section of Mathlib, an area of the library that is comparatively undeveloped, and one where the interest of working analysts is needed. It was organized by Jeremy Avigad and Matthew Ballard for ICARM, together with Tatiana Toro (SLMath and the University of Washington), Rémy Degenne (Inria, Lille), and Michael Rothgang (Universität Bonn). The online component was supported by Avigad, Ballard, and innovation engineer David Renshaw.

The program consisted of a series of three lectures by Degenne and Rothgang, followed by interactive working sessions on Monday, Tuesday, and Thursday afternoons. Participants were also encouraged to work through exercises, and Degenne and Rothgang were on hand during the week to answer questions and engage in more focused discussion. There are now multiple projects focused on formalizing PDEs. One of them is due to Weiran Sun, who attended the workshop and benefited from discussions there.

Joint Mathematics Meetings

January 4–7, 2026 · Walter E. Washington Convention Center, Washington, DC

The Joint Mathematics Meetings are the largest annual gathering of mathematicians in the United States, and they gave ICARM its best opportunity of the year to introduce itself to the mathematical community at large. The institute contributed in four ways.

ICARM staffed a booth in the exposition hall for the duration of the meeting, where visitors could learn about the institute's programs, see demonstrations of proof assistants and other tools, and talk with our innovation engineers. The booth included videos produced by ICARM staff for the occasion.

ICARM presented a two-part tutorial, "Efficient Search for Combinatorial Objects," on the use of automated reasoning to locate combinatorial objects. Slides from both days are posted on the ICARM web site. The tutorial was aimed at mathematicians with no prior experience of SAT solvers, and showed how these tools can settle combinatorial questions that are out of reach by hand.

ICARM took part in the Mathematical Institutes Open House, a reception held on January 5 at which the mathematical sciences institutes present their programs and workshops to prospective participants.

Finally, Geordie Williamson highlighted ICARM's work in one of his well-attended plenary lectures.

Aarhus Mathematics & AI Workshop

January 27–30, 2026 · Aarhus, Denmark

Avigad and Ballard served on the scientific board of this meeting, which was organized by Gergely Bérczi, François Charton, and Amaury Hayat. Ballard and innovation engineer David Renshaw took part in the meeting, contributing technical expertise and representing the institute to a European audience.

AI and Number Theory at the American Institute of Mathematics

May 27–30, 2026 · American Institute of Mathematics, Pasadena, CA

Innovation engineers David Renshaw and Blake Jackson attended this AIM workshop to provide technical assistance to the organizers and participants, give lectures, and help the working groups make use of proof assistants, search tools, and machine learning methods over the course of the week. This is a model we expect to repeat: an ICARM engineer embedded in someone else's workshop can remove technical obstacles that would otherwise consume a working group's time, at very little cost to the institute.

One project begun at this workshop has since produced a notable result: Blake Jackson, with Xiaoyu Huang (Temple University), Kyu-Hwan Lee (University of Connecticut and the Korea Institute for Advanced Study), Bjorn Poonen (MIT), Rachel Pries (Colorado State University), and Shaowu Zhang (Caltech), realized the Mathieu group M23 as a Galois group over the rational numbers, exhibiting a concrete degree-23 polynomial with rational coefficients whose splitting field has Galois group M23 over Q. This settles the last of the twenty-six sporadic finite simple groups, a case that had stood open for some four decades. The team used large language models throughout, for literature search, code generation, hypothesis testing, verification, and

review of the manuscript, and the accompanying code is publicly available. The result is described further under Scientific Outcomes below.

Exploring Constructions in Mathematics Using AI Tools

July 20–21, 2026 · Rashid Auditorium, Gates Hillman Complex, Carnegie Mellon University, Pittsburgh, PA

ICARM sponsored a plenary lecture by Adam Zsolt Wagner at Combinatorics at the Confluence, a satellite conference of the International Congress of Mathematicians hosted by Carnegie Mellon and organized by Tom Bohman, Chris Eur, Florian Frick, Penny Haxell, Kiumars Kaveh, Bob Krueger, Jinyoung Park, and Andrés Vindas Meléndez. Wagner's lecture discussed how AI tools can reduce the effort required to find the right questions, explore variants of a problem, test ideas, and find good constructions, with practical examples and a comparison of the approaches available for different kinds of mathematical problems. He followed it the next morning with a hands-on tutorial.

Mathematics in Lean, a special session at ICMS 2026

July 23, 2026 · International Congress on Mathematical Software, Waterloo, ON

Matthew Ballard organized this special session on formalization in Lean at the International Congress on Mathematical Software, together with Rémy Degenne (Université de Lille) and Damiano Testa (University of Warwick). ICMS 2026, held July 20–23 at Wilfrid Laurier University and the University of Waterloo, was itself a satellite meeting of the International Congress of Mathematicians. The session comprised seven talks:

- Lorenzo Bresolin and Marcello Mamino, "Reflections on Trusting Lean"
- Zhengqin Fan and Simon DeDeo, "Ablation: A Tool for Probing Creativity and Constraint in Formalization Agents"
- Jovan Gerbscheid, "Automatically translating definitions and proofs"
- Sidharth Hariharan, "Progress in Formalising Sphere Packing in Dimension 8"
- Bhavik Mehta, "Formalising Polychromatic Colourings of Integers"
- Alex Meiburg, "The Generalized Quantum Stein's Lemma"
- Anthony Vandikas and Kiarash Sotoudeh, "Formalizing Quasi-Borel Spaces in Lean 4"

Research Experiences for Undergraduate Faculty at the American Institute of Mathematics

July 27–31, 2026 · American Institute of Mathematics, Pasadena, CA

Avigad was a faculty mentor in a Research Experience for Undergraduate Faculty (REUF), organized by Brianna Donaldson, Leslie Hogben, and Ulrica Wilson. Avigad ran a week-long tutorial on Lean with a subgroup of six people, and explored ways it can be used to teach research and teaching. He also gave a survey lecture on AI for Mathematics to the full REUF program. Avigad will continue to meet weekly with the group during the 2026/2027 academic year.

Resources and Innovation Engineering

The feature that most distinguishes ICARM from other mathematical sciences research institutes is its technical staff. New technologies for computer-aided reasoning are often developed by computer scientists without mathematics research in mind. It is up to the mathematics community to learn how to use the tools effectively and adapt them to their needs. Our innovation engineers provide support by writing documentation, maintaining libraries and infrastructure, assembling datasets, and curating benchmarks. Their charge is to help mathematicians learn to use the technologies; to answer questions and provide technical support; to maintain documentation, tools, infrastructure, and other community resources; to serve as liaisons to computer science and industry; to carry out the essential tasks that academics have no time or incentive to do; to be community leaders in the use of the technology; and to gather resources and coordinate efforts. This section enumerates some of the specific activities they engaged in during our first year.

Support for ICARM Meetings

The innovation engineers contributed to the preparation and running of ICARM's own meetings. They helped prepare and run the Workshop on Algebraic Geometry and Machine Learning and the Summer School on Formalization of Mathematics, in both cases, helping participants install and run the relevant software. David Renshaw also produced the videos and demonstrations for the ICARM booth at the Joint Mathematics Meetings and helped staff it.

Support for Other Meetings

Innovation engineers David Renshaw and Blake Jackson provided technical assistance at the AI and Number Theory workshop at the American Institute of Mathematics in May, and Renshaw took part in the AI and mathematics meeting at Aarhus University in January; both are described under Off-Site Activities above. Staff also contributed to the preparation of a proposal for the SACNAS annual conference and will prepare two tutorials for ICARM to present the Modern Math Workshop at SACNAS in October 2026.

Higher-Dimensional Sphere Packing

Renshaw assisted a project, led by Sidharth Hariharan, Christopher Birkbeck, Seewoo Lee, Bhavik Mehta, and Maryna Viazovska, to formalize Viazovska's celebrated result on the optimality of the E_8 sphere packing, and the institute mediated interactions with Math Inc., an AI startup that devoted considerable computational resources to generating formalizations without the group's consent. The group has acknowledged ICARM's help in a preliminary report, and the group's challenges facing Math Inc. have been described in The New York Times.

Matroid Database

To support data mining and formation of conjectures, ICARM hosts a database of matroids. These offer enumerations of matroids by pairs (n, r), where n is the number of elements and r is the rank. The database includes exhaustive collections of the following:

- 4,886,380,924 matroids on 10 elements of rank 4
- 3,222,227,959,444 matroids on 10 elements of rank 5
- 4,886,380,924 matroids on 10 elements of rank 6

- 9,156,392,629 matroids on 13 elements of rank 3

The database is already being used by the researchers in algebraic combinatorics and will be utilized in an ICARM workshop on Matroids and Combinatorics next spring. Innovation engineer David Renshaw was an essential part of building the database, coordinating work, provisioning servers from the Pittsburgh Supercomputing Center, building a web front end, and running and debugging code.

Quiver Mutation Database

The Quiver Mutation Database, built and maintained by innovation engineer Blake Jackson, is open research infrastructure for quivers, exchange matrices, and mutation-equivalence classes. It catalogues quivers of rank one through four, both distinct and labeled, with rigorously defined invariants: rank, Dynkin type, representation type, and connectivity. Users can browse the full dataset with sorting and filtering, search by rank, Dynkin type, or invariant, draw a random quiver or mutation class, and export any filtered selection as CSV or Excel.

Other Databases and Leaderboards

Alongside this support work, the engineers built and maintained shared resources for the community. During the first year these included:

- the Equation 677 Database, which gathers the results related to that equation in the Equational Theories Project;
- the Elliptic Curve Rank Leaderboard, which certifies every submitted curve before ranking it, so that the leaderboard records certified ranks rather than claimed ones;
- Matroid Correlation Constants, which asks how correlated the bases of a matroid can be;
- and a collaborative site on Ruzsa's genus-one problem.

These and others are found on ICARM's web pages.

The elliptic curve leaderboard was put to good use in August 2026, when a contributor posting as "ranksunbounded" submitted the first known elliptic curve of rank 30, surpassing the rank-29 record certified by Elkies and Klagsbrun in 2024. Because the leaderboard verifies a curve before ranking it, the institute was able to report the new record as certified rather than merely claimed. The user, revealed later to be Levent Alpoge and Ava Howell working with Anthropic's Claude, subsequently posted a rank 31 curve. Leading researchers, including Noam Elkies, have joined the ICARM Zulip forum where discussion is ongoing.

Community Infrastructure

ICARM maintains its web site at icarm.io, where mathematicians can register with the institute, join our mailing list, propose a workshop, or propose a collaborative visit. The site also serves as the public record of our meetings, with schedules, abstracts, and materials from past events, including the slides from the Joint Mathematics Meetings tutorial. The ICARM logos were designed by Arjen van Lith and Marijn Heule.

The institute also runs a semi-private Zulip server, which has become the connective tissue of the institute's work. It is used internally for administration and for discussions among the advisory

boards; by the organizers and participants of our meetings, before, during, and after the meetings themselves; and as a home for public research discussions, including the First Proof and milestones discussions, as well as a private discussion for the expMath community. A persistent forum of this kind turns a week-long workshop into a continuing conversation, which is one of the ways a small institute can have an effect out of proportion to its budget. The value of this service is not merely notional: four arXiv papers and one widely read essay acknowledge or cite the First Proof discussion hosted on the ICARM server, and the Lean code accompanying a recent paper on matroids over triangular hyperfields is hosted in the institute's GitHub organization. These are recorded under Citations and Mentions below.

Our mailing list currently has 427 contacts and is growing steadily. We will begin sending out a quarterly newsletter this fall.

Scientific Outcomes

This section gathers some of the scientific results, artifacts, and collaborations that came out of the institute's first year, whether they arose at ICARM's own meetings, at meetings the institute contributed to, or from the work of its innovation engineers. Because ICARM's first full meetings were held in the spring and summer of 2026, most of what follows is recent, and in several cases the work is continuing.

Research Results

At the Workshop on Algebraic Geometry and Machine Learning, ten working groups took up problems proposed by the participants, described under Meetings above. Participants reported new collaborations, expected preprints from several groups, and, in two cases, plans to build the methods they learned into forthcoming grant proposals. One participant began a new line of work on the mathematics of mechanistic interpretability; another initiated projects on finite magmas and on foundation models for polyhedral geometry.

The Summer School on Formalization of Mathematics has produced at least two pull requests to Mathlib, the Lean community's mathematical library, with more expected from the second-week group projects; one student's work on the formalization of polytopes continues at a follow-on event in Berlin.

ICARM's innovation engineers assisted the collaborative formalization of the sphere packing theorem in dimension eight, and the institute is acknowledged in the resulting paper; the project was reported on at the Mathematics in Lean session that ICARM organized at ICMS 2026. David Renshaw contributed to the formalization of quantum field theory reported by Douglas, Hoback, Mei, and Nissim, who acknowledged his support, and to the Equational Theories Project, where he is listed as a contributor with an ICARM affiliation. The Lean formalization accompanying recent work of Baker, Huh, Kummer, and Lorscheid on Lorentzian polynomials and matroids over triangular hyperfields was supported by David Renshaw and is hosted in the institute’s GitHub organization.

The Mathieu group M23 was realized as a Galois group over the rational numbers, the last of the sporadic simple groups for which this was open. The result is joint work of Xiaoyu Huang, Blake

Jackson, Kyu-Hwan Lee, Bjorn Poonen, Rachel Pries, and Shaowu Zhang, and the paper records that Jackson's contribution was supported by ICARM. It is the most substantial mathematical result yet to carry the institute's support.

Datasets and Software

The institute's innovation engineers built and maintained a database of matroids, a leaderboard of elliptic curve ranks, and a database arising from the Equational Theories Project; these are described under Resources and Innovation Engineering above.

The Inverse Galois working group at the algebraic geometry workshop produced a database of smooth cubic surfaces over the rationals realizing specified subgroups of W(E6) as the Galois action on their 27 lines. It is publicly available and will be described in a forthcoming paper.

Benchmarks and Community Discussion

The Milestones of Autonomous Mathematics workshop was convened to establish benchmarks for progress in AI-assisted mathematics, and a document compiling its results is being prepared by Elliot Glazer in coordination with the organizers.

ICARM hosted the first First Proof discussion on its Zulip server, which has become a reference point for the community assessing the performance of AI systems on research-level mathematics.

People

ICARM is led by a director and associate director with a team of assistant directors, supported by administrative and technical staff, and guided by four boards: scientific, educational, and strategic advisory boards, and a university oversight board. The three advisory boards were constituted during the first year and the university oversight board held its first meeting in June 2026.

Leadership

The director and associate director are responsible for the running of ICARM on a day-to-day basis. Our assistant directors contribute to the institute's mission in diverse ways, from general advice and guidance to assistance with individual activities and events.

- **Jeremy Avigad**, Director, Carnegie Mellon University
- **Matthew Ballard**, Associate Director, University of South Carolina
- **Irina Gheorghiciuc**, Assistant Director for Educational Activities, Carnegie Mellon University
- **Marijn Heule**, Assistant Director for Scientific Activities, Carnegie Mellon University
- **Prasad Tetali**, Assistant Director for Operations, Carnegie Mellon University
- **Sean Welleck**, Assistant Director for Scientific Activities, Carnegie Mellon University
- **Aris Winger**, Assistant Director for Outreach, Georgia Gwinnett College
- **Michael Young**, Assistant Director for Outreach, Carnegie Mellon University

Staff

Our administrative staff consists of a single full-time member:

- **Jennifer Agnew**, Senior Administrative Coordinator

The Office of the Vice President for Research and the Office of the Provost assist with business and grants management.

We have three technical staff:

- **Blake Jackson**, Innovation Engineer
- **Aayush Rajasekaran**, Innovation Engineer
- **David Renshaw**, Innovation Engineer

Renshaw joined a few months into the award; Jackson and Rajasekaran at the end of the first year. We initially relied on the Pittsburgh Supercomputing Center for IT assistance setting up our web pages, before taking our IT in-house and moving to a custom system developed by our leadership and staff.

Scientific Advisory Board

The Scientific Advisory Board provides independent guidance to ensure that ICARM advances its mission to support the use of new technologies for mathematical reasoning. The board's responsibility is to advise the Director and Associate Directors on the scientific direction, scope, and quality of ICARM's programs and resources. It meets virtually with the institute's leadership twice a year.

- **Jennifer Balakrishnan**, Professor, Department of Mathematics and Statistics, Boston University
- **François Charton**, Technical Staff, Axiom
- **Johan Commelin**, Director, Mathlib Initiative, and Assistant Professor, Department of Mathematics, Utrecht University
- **Sébastien Gouëzel**, Research Director, Centre national de la recherche scientifique (CNRS)
- **Emily Riehl**, Kelly Miller Professor of Mathematics, Johns Hopkins University
- **Radmila Sazdanovic**, Associate Professor, Department of Mathematics, North Carolina State University
- **Adam Zsolt Wagner**, Research Scientist, Google DeepMind

Educational Advisory Board

The Educational Advisory Board advises the Institute on its mission to support mathematics education, particularly regarding the use of new technologies for mathematical reasoning. Its members initially join the meetings of the Scientific Advisory Board.

- **Chris Sangwin**, Professor of Mathematics Education, University of Edinburgh
- **Keith Weber**, Distinguished Professor and Chair, Department of Teaching and Learning, Rutgers University

Strategic Advisory Board

The Strategic Advisory Board ensures that the Institute remains ambitious, forward-looking, and responsive to the broader mathematical and scientific community. The Strategic Advisory Board provides strategic counsel, strengthens governance, and connects the Institute to external partners and resources. The leadership of ICARM meets with members of the Strategic Advisory Board on an ad hoc basis.

- **Tudor Achim**, Co-Founder and Chief Executive Officer, Harmonic
- **Leonardo de Moura**, Senior Principal Applied Scientist, Automated Reasoning Group, Amazon Web Services, and Chief Architect and Co-Founder, Lean Focused Research Organization
- **Pushmeet Kohli**, Vice President of Science and Strategic Initiatives, Google DeepMind
- **Cindy Lawrence**, Executive Director and Chief Executive Officer, National Museum of Mathematics
- **Jason Rute**, AI Scientist, Mistral AI
- **Ravi Vakil**, Robert Grimmett Professor of Mathematics, Stanford University, and President, American Mathematical Society
- **Melanie Matchett Wood**, William Caspar Graustein Professor of Mathematics, Harvard University

University Oversight Board

Carnegie Mellon University will provide fiscal and management oversight for the institute. The Institute is overseen by the Office of the Vice President for Research and the University Oversight Board. Members of the University Oversight Board serve by virtue of their positions in the university.

- Theresa Mayer, **Vice President for Research**
- Martial Hebert, **Dean of the School of Computer Science**
- Barbara Shinn-Cunningham, **Dean of the Mellon College of Science**
- Richard Scheines, **Dean of the Dietrich College of Humanities and Social Sciences**
- Amy Burkert, **Vice Provost for Education**
- Barr von Oehsen, **Director of the Pittsburgh Supercomputing Center**
- Wanda Heading-Grant, **Vice Provost for Community, Culture and Engagement**
- Pamela Eager, **Senior Associate Vice President for University Advancement**

In the institute's second year, Scheines will be replaced by Cassidy Sugimoto, who has succeeded him as the dean of Dietrich College.

Principal Investigators

The Principal Investigators on NSF Grant DMS 2425401 are as follows.

Jeremy Avigad is the Director of the Institute for Computer-Aided Reasoning in Mathematics (ICARM), Dean's Professor of Logic and Philosophy of Mathematics, and Professor of Mathematical Sciences at Carnegie Mellon University. He has published extensively in

mathematical logic, formal verification, and history and philosophy of mathematics, and he currently works on applications of formal methods and AI to mathematics.

Matthew Ballard is the Associate Director at ICARM and Professor of Mathematics at the University of South Carolina. He has published extensively in algebraic geometry, particularly on derived categories and questions arising from homological mirror symmetry, and he is a member of the maintainer group for Mathlib, the library of mathematics formalized in the Lean programming language. He is a Fellow of the American Mathematical Society.

Prasad Tetali is an Assistant Director at ICARM and Alexander M. Knaster Professor and Head of the Department of Mathematical Sciences at Carnegie Mellon University. His research is in discrete mathematics, probability, and the theory of computing, including Markov chains, isoperimetry and functional analysis, combinatorics, and approximation algorithms. He is a fellow of the Society for Industrial and Applied Mathematics and one of the inaugural fellows of the American Mathematical Society and served as editor-in-chief of the SIAM Journal on Discrete Mathematics.

Citations and Mentions

This section records published work that cites or acknowledges ICARM, press coverage of the institute and its activities, and mentions on web pages maintained by others. The list is not exhaustive.

Papers

Two papers cite NSF grant DMS-2425401 directly:

- Xiaoyu Huang, Blake Jackson, Kyu-Hwan Lee, Bjorn Poonen, Rachel Pries, and Shaowu Zhang, “The Mathieu Group M23 is a Galois Group over Q,” August 9, 2026. https://arxiv.org/abs/2608.08538
- Tony Feng, Junehyuk Jung, Sang-hyun Kim, Carlo Pagano, Sergei Gukov, Cheng-Chiang Tsai, David P. Woodruff, et al., “Aletheia tackles FirstProof autonomously,” February 2026. https://arxiv.org/abs/2602.21201

These papers mention the institute:

- Matthew Bolan, Joachim Breitner, David Renshaw, Terence Tao, et al., “The Equational Theories Project: Advancing Collaborative Mathematical Research at Scale,” December 8, 2025. David Renshaw is listed among the contributors with an ICARM affiliation. https://arxiv.org/abs/2512.07087
- Tony Feng, Trieu H. Trinh, Garrett Bingham, Demis Hassabis, Koray Kavukcuoglu, Quoc V. Le, and Thang Luong, et al., “Towards Autonomous Mathematics Research,” February 2026. A companion to the Aletheia paper; it cites the First Proof discussion on the ICARM Zulip server. https://arxiv.org/abs/2602.10177
- Jeremy Avigad, “Mathematicians in the Age of AI,” March 2026. An essay that discusses the launch of ICARM and the First Proof episode, including the request that ICARM host the

discussion.
https://arxiv.org/abs/2603.03684

- Michael R. Douglas, Sarah Hoback, Anna Mei, and Ron Nissim, "Formalization of QFT," March 16, 2026. The authors thank "David Renshaw (who is supported by ICARM)" for his contributions to their formalization.
https://arxiv.org/abs/2603.15770
- Sidharth Hariharan, Christopher Birkbeck, Seewoo Lee, Ho Kiu Gareth Ma, Bhavik Mehta, Auguste Poiroux, and Maryna Viazovska, "Progress in Formalizing Sphere Packing in Dimension 8." The authors acknowledge support from ICARM. The project was assisted by the institute's innovation engineers and was reported on in the Mathematics in Lean special session at ICMS 2026.
https://arxiv.org/abs/2604.23468
- Mohammed Abouzaid, Nikhil Srivastava, et al., "First Proof Second Batch," June 16, 2026, which describes ICARM as the institute "which will host the Zulip for our community."
https://arxiv.org/abs/2606.18119
- Matthew Baker, June Huh, Mario Kummer, and Oliver Lorscheid, "Lorentzian polynomials and matroids over triangular hyperfields, Part 2: Analytic aspects," July 16, 2026. The accompanying Lean formalization is hosted in the ICARM GitHub organization.
https://arxiv.org/abs/2607.15375

News Articles

- "The AI revolution in math has arrived." Quanta Magazine, April 13, 2026.
https://www.quantamagazine.org/the-ai-revolution-in-math-has-arrived-20260413/
- "To have machines make math proofs, turn them into a puzzle." Quanta Magazine, November 10, 2025. An article on the work of Marijn Heule, ICARM Assistant Director for Scientific Activities.
https://www.quantamagazine.org/to-have-machines-make-math-proofs-turn-them-into-a-puzzle-20251110/
- "Mathematics is undergoing the biggest change in its history." New Scientist, March 10, 2026.
https://www.newscientist.com/article/2518526-mathematics-is-undergoing-the-biggest-change-in-its-history/
- "A golden age of maths is dawning and mathematicians are freaking out." New Scientist, June 1, 2026. Draws on the Milestones of Autonomous Mathematics workshop, which the author attended.
https://www.newscientist.com/article/2526650-a-golden-age-of-maths-is-dawning-and-mathematicians-are-freaking-out/
- "They Spent Years on a Math Problem. Then They Were Scooped by A.I." Describes the higher-dimensional sphere-packing formalization and interactions with a startup AI company.
https://www.nytimes.com/2026/06/08/science/ai-scoop-young-mathematicians.html

Web Pages and Blogs

- First Proof, first batch. ICARM's support is acknowledged on the project's web pages.
https://1stproof.org/first-batch.html

- Math Inc., sphere packing announcement. Acknowledges ICARM's contribution to the formalization of the sphere packing theorem in dimension eight. https://www.math.inc/sphere-packing
- Daniel Litt, "Mathematics in the Library of Babel," February 21, 2026. An essay on the recent performance of AI models on research-level mathematics, which acknowledges ICARM "for hosting online discussion of the FirstProof results." https://www.daniellitt.com/blog/2026/2/20/mathematics-in-the-library-of-babel/
- "Formalising Sphere Packing in Lean," the project site for the formalization of Viazovska's solution of the sphere packing problem in dimension eight, maintained by Chris Birkbeck, Sidharth Hariharan, Bhavik Mehta, and Seewoo Lee. The site states: "We are indebted to the Institute for Computer-Aided Reasoning in Mathematics for their help on matters of AI policy." https://thefundamentaltheor3m.github.io/Sphere-Packing-Lean/