INdAM
Istituto Nazionale di Alta Matematica
"Francesco Severi"

ONLINE · 2026

ONLINE SEMINAR SERIES

Lean, Formalized Mathematics and AI-Assisted Discovery

13 FRI · NOV	**Jeremy Avigad** *The Future of Mathematics* Carnegie Mellon University	14:30
23 MON · NOV	**Giovanni Paolini** *Aligning AI with mathematical discovery* University of Bologna	14:30
2 WED · DEC	**Kevin Buzzard** *Lean for the working mathematician* Imperial College London	14:30
14 MON · DEC	**Riccardo Brasca** *Can We Really Trust a Lean Proof? What We Gain from Human- and AI-Written Proofs* Université Paris Cité	14:30

HOW TO JOIN

Online seminars · 14:30 CET

Live on the INdAM YouTube channel:

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ONLINE SEMINAR SERIES

Abstracts

13 NOV · 14:30 · JEREMY AVIGAD

The Future of Mathematics

Advances in AI are disrupting the mathematics profession. Popular media has portrayed mathematics as facing an existential crisis and mathematicians as losing their sense of purpose. These portrayals are harmful and misleading: in the age of AI, mathematics is as important as ever, and we are well equipped to face the challenges. This talk will survey recent events and present a positive outlook.

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23 NOV · 14:30 · GIOVANNI PAOLINI

Aligning AI with mathematical discovery

As AI systems become increasingly capable of solving mathematical problems, an alignment challenge emerges: Is a solution presented in a satisfactory way? Does it contain substantial new ideas? And would a solution considered valid by an AI system also be considered valid by a mathematician? I will illustrate these questions through the story of qtBench, a project exploring AI-assisted mathematical discovery in algebraic combinatorics. Our experience highlights how even formally correct solutions may not be the kind of solutions mathematicians are looking for, a distinction that, in our case, even verification in Lean did not capture.

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2 DEC · 14:30 · KEVIN BUZZARD

Lean for the working mathematician

What does a working mathematician need to know about Lean? Learning how to write proofs in Lean is hard work. But learning how to read theorem statements written in Lean is much easier. Some mathematics proofs now are coming with Lean code which claims to check the proof, so being able to understand exactly what the Lean code is proving can be a useful skill. This talk will mostly be a tutorial about how to translate Lean statements of mathematical theorems back into English. No prior knowledge of Lean will be assumed.

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14 DEC · 14:30 · RICCARDO BRASCA

Can We Really Trust a Lean Proof? What We Gain from Human- and AI-Written Proofs

What do we gain from a proof written in Lean, and does the answer change when an AI writes it? When mathematicians formalize an argument, the process can improve the mathematics. In the Liquid Tensor Experiment, formalization led to a simplification of the argument and showed Scholze “what actually makes the proof work”. When an LLM writes the proof, we no longer have to trust the AI, but the proof doesn’t have to explain anything. The recent formalization of Fermat’s Last Theorem by Claude, 13 million lines of Lean, is “written to be checked rather than read”.

But how far can we trust a formalized proof? We will study the ways in which a Lean proof can fail to say what we think it says. First, the definitions and the statement may not express the theorem we have in mind. Humans write them having an intuitive understanding, and in a library such as mathlib everything is carefully reviewed. On the other hand, an AI can write millions of lines in a few weeks, and it may be difficult to check that the statements are correctly written. Second, Lean itself, like any software, may contain bugs. Third, a Lean proof can be correct and still differ from the argument written for humans in the accompanying paper, as has been argued for OpenAI’s announced solution of the Navier–Stokes problem. OpenAI’s recent release of hundreds of manuscripts, many with Lean formalizations, makes these questions urgent.