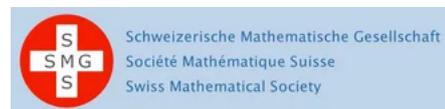


# Abstracts: Formalization and Proof Assistants

Swiss Mathematical Society Spring Meeting, March 2026

Supported by:



Wednesday, March 25th

**Moritz Firsching** (Google): *The Formal Conjectures Project*

“Formal Conjectures” is a collection of mostly unsolved formal mathematical statements. We explore mitigating mis-formalisations, using AlphaProof to settle conjectures, and explain how it provides an interface between human researchers and AI.

**Stefan Kebekus** (Uni Freiburg): *Project VD – Formalizing Value Distribution Theory*

This talk presents recent progress towards a formalization of value distribution theory (also known as Nevanlinna Theory) of complex analysis. It discusses challenges experienced in the formalization and potential future directions.

**Goran Zuzic** (Google): *AlphaProof – RL for Math, Gold Medals for Gemini, and Beyond*

Recent advancements in Artificial Intelligence have demonstrated that neural networks can achieve medal-level performance at the International Mathematical Olympiad (IMO) and the International Collegiate Programming Contest (ICPC). This talk presents a technical overview into AlphaProof, a reinforcement learning-based system that operates within the Lean proof assistant to solve complex mathematical problems.

We will examine the methodology behind AlphaProof, focusing on its neuro-symbolic architecture that combines the explorative power of large language models with the rigorous verification of formal logic. Key components include autoformalization to bridge natural and formal languages, and the treatment of theorem proving as a game solved via AlphaZero-style search.

Finally, we will discuss the broader implications of these technologies for research mathematics and theoretical computer science. We will conclude with an overview of the latest AI systems that have recently achieved Gold medal standards in both mathematics and competitive programming.

**Chi-Yun Hsu** (Santa Clara University): *Bijjective vs Analytic – Formalizing Euler’s Partition Identity*

Euler's Partition Identity states that the number of ways to write a positive integer  $n$  as a sum of odd positive integers and as a sum of distinct positive integers are equal. While `mathlib4` contains the proof of Euler's Identity via generating series, we formalized the alternative proof through the explicit Glaisher bijection. We will compare the analytic and bijective approaches, describe the primary challenges of the formalization of the bijection, and outline the future generalizations to formalize the bijective proof of Glaisher's identity. This is joint work with Tamanna Agarwal and Hanzhe Zhang.

**Oliver Dressler** (Math, Inc. / FFHS): *lean-lsp-mcp: A toolbox for agents to interact with Lean*

`lean-lsp-mcp` exposes the Lean language server to AI agents, enabling grounded feedback loops for automated verification. This talk presents the tool's functionality, recent research use cases, and a demo.

**Sina Hazratpour** (Cambridge): *Formalization of polynomial functors in Lean 4*

I present a framework for formalizing synthetic mathematical theories, such as homotopy type theory, in Lean 4. The advantages are three-fold: obtaining more conceptual and shorter proofs, bridging the gap between existing formalizations in proof assistants and great source for AI dataset.

## Thursday, March 26th

**David Angdinata** (University of East Anglia): *Torsion subgroups of elliptic curves in Lean*

Abstract TBA

**Manuel Eberl** (Universität Innsbruck): *Formalising Complex Analysis in Isabelle/HOL*

In this talk, I will show some formalisation techniques that we used recently to formalise complex analysis in Isabelle/HOL. In particular, I will show how we deal with the hand-waving that is typically present in paper proofs involving complex analysis (avoiding poles on integration contours, implicit cancellation of removable singularities) and how we make use of the connection between algebraic objects (namely formal Laurent series) to reason about analytic functions. This will be illustrated on results about elliptic functions, modular forms, and related topics.

**Alessandro Iraci** (Università Telematica Pegaso): *Machine Discovery in Combinatorics*

A recurrent problem in algebraic combinatorics is the search for pairs of statistics on certain sets of objects matching exact polynomial distributions, such as the  $q, t$ -Catalan polynomials. This problem can be tackled with Machine Learning with the help of Proof Assistants.

**Hang Lu Su** (independent, formerly ICMAT Madrid): *Formalizing finitely presented groups*

Abstract TBA

**Johannes Überberg** (MathGarden): *Naivle, A Proof Verification System for Textbook-Style Mathematics*

We introduce Naivle, a new proof verification system. Unlike traditional proof assistants, Naivle models textbook-style informal proofs and provides explicit, human-oriented explanations for why each accepted step is considered correct. We present early case studies drawn from naive set theory.

**Michael Stoll** (Universität Bayreuth): *Heights in arithmetic geometry*

Abstract TBA

## Friday, March 27th

**Maryna Viazovska** (EPFL): *title tba*

**Sidharth Hariharan** (Carnegie-Mellon): *Formalising Sphere Packing*

**Auguste Poiroux** (Math, Inc. / EPFL): *Autoformalization of the strong Prime Number Theorem*

Auguste's talk will be followed by a **round-table discussion** on the topic of "Collaboration between AI companies and the formalization community".

*Colloquium talk*

**Floris van Doorn** (Universität Bonn): *Lean – Collaboration using Formalization*

**General Assembly of the Swiss Mathematical Society**