

INCONTRO INdAM – Lean for the curious Mathematician

Palazzone di Cortona, 7-11 September 2026

Scientific Program

Monday, 7th September

9:00-9:15 Registration

9:15-9:30 Opening (Riccardo Brasca)

9:30-10:30 Tutorial (Riccardo Brasca): Basic Tactics: `intro` + `basic syntax` + `apply` have `intro` `exact` `rw` `rfl` `assumption` `contradiction`

10:30-11:00 Coffee Break

11:00-12:30 Free discussions, practice and study

12:30-14:00 Lunch

14:00-15:00 Research Talk: Nirvana Coppola “*The formalization of the Hasse-Minkowski Theorem: an ongoing WIN project*”.

15:00-16:00 Tutorial (Fabrizio Barroero): Logic: `and` or `constructor` cases, `by_contra`, `push Not`, `exfalso`

16:00-16:30 Coffee break

16:30-18:00 Free discussions, practice and study

Tuesday, 8th September

9:30-10:30 Tutorial (Christian Merten): Advanced Tactics. `simp`, `ring`, `use/obtain` `congr/gcongr`/`grw` `induction`

10:30-11:00 Coffee Break

11:00-12:30 Free discussions, practice and study

12:30-14:00 Lunch

14:00-15:00 Research Talk: Marco Pedicini “*Lean and Cryptographic Reasoning*”.

15:00-16:00 Tutorial (Riccardo Brasca): Working with Mathlib

16:00-16:30 Coffee break

16:30-18:00 Free discussions, practice and study

20:00- 23:00 Social Dinner

Wednesday, 9th September

- 9:30-10:30** Tutorial (Filippo Nuccio): Structures and Classes
- 10:30-11:00** Coffee Break
- 11:00-12:30** Free discussions, practice and study
- 12:30-14:00** Lunch
- 14:00-15:00** Research Talk: Riccardo Brasca: “*Autoformalization and AI*”
- 15:00-16:00** Free discussions, practice and study
- 16:00-16:30** Coffee break
- 16:30-18:00** Free discussions, practice and study

Thursday, 10th September

- 9:30-10:30** Tutorial (Filippo Nuccio): Algebra and (some) Number Theory
- 10:30-11:00** Coffee Break
- 11:00-12:30** Free discussions, practice and study
- 12:30-14:00** Lunch
- 14:00-15:00** Research Talk: Floris van Doorn “*The Carleson Project: Collaboration using Formalization*”
- 15:00-16:00** Tutorial (Floris van Doorn): Topology and Analysis
- 16:00-16:30** Coffee break
- 16:30-18:00** Free discussions, practice and study

Friday, 11th September

- 9:30-10:30** Research Talk: Christian Merten “*Formalising the ℓ -adic cohomology of an algebraic variety*”
- 10:30-11:00** Coffee Break
- 11:00-12:30** Returns on exercises and on Major Exploits
- 12:30-14:00** Lunch

Abstracts for the Research Talks

Nirvana Coppola (Padova)

Title The formalization of the Hasse-Minkowski Theorem: an ongoing WIN project.

Abstract Number theory has been one of the hottest topics in formalization ever since Lean became widely known and used. Yet many classical results still have to be formalized, and doing so can be very instructive and fun! In this talk, I will present a project in progress on the formalization of the (Hasse-)Minkowski theorem on quadratic forms, namely, that any quadratic form defined over the rational field that admits a solution over every completion (the p -adic and real ones) also admits a global rational solution. I will present the proof strategy (following Serre) and discuss some of the most challenging results to formalize. This project stems from the Women in Numbers 7 workshop, and it is joint work with María Inés de Frutos Fernández, Mallory Dolorfino, Kate Finnerty, Catherine Hsu, and Chi-Yun Hsu.

Marco Pedicini (Roma Tre)

Title Lean and Cryptographic Reasoning

Abstract The Curry–Howard correspondence teaches us to read proofs as programs: a proof is not only evidence for truth, but a structured object carrying computational content. Starting from the one-time pad, this talk follows that idea into Lean and VCVio, where cryptographic algorithms, probabilistic experiments, assumptions, and constructions become explicit typed objects checked by a small kernel. An XOR identity gives correctness, while Shannon’s perfect secrecy is a property of distributions. The distinction between a probabilistic computation and its mathematical interpretation through `evalDist` also provides a concrete setting for reasoning with non-computable objects.

Floris van Doorn (Bonn)

Title The Carleson Project: Collaboration using Formalization

Abstract In this talk I will describe the Carleson project, a formalization of a modern generalization of Carleson's 1966 theorem in harmonic analysis about the pointwise convergence of Fourier series. This is a major result in harmonic analysis with a difficult proof, and the formalization was a large collaborative project with 17 main contributors that was finished last year. This talk will discuss how we organized the collaboration and the lessons we learned.

Christian Merten (Utrecht)

Title Formalising the ℓ -adic cohomology of an algebraic variety

Abstract An algebraic variety is a geometric object defined locally by polynomial equations over a base field. When this field is finite, one can associate a zeta function that encodes point counts. In 1949, Weil formulated a set of conjectures about this function, now known as the Weil conjectures. Building on foundational work by Artin and Grothendieck, Deligne proved them in 1974 using the theory of ℓ -adic cohomology, itself built from étale cohomology. In mathlib, the ℓ -adic cohomology of a variety is defined via the pro-étale site of Bhatt–Scholze. In this talk I will describe the formalisation of the fact that this definition agrees with the classical one, and explain how it fits into mathlib's development of algebraic geometry. This is joint work with Jiedong Jiang (Westlake University).