RUC & PKU Joint Lean Workshop (III)

Time & Location:

Part I: April 29 – May 2 (Tuesday to Friday) Lecture Hall, Jiayibing Building (2nd Floor, Jingchunyuan 82) BICMR, Peking University

Part II:May 3 – May 5 (Saturday to Monday) Innovation Lab, Mingli College (West of Entrance A1, 1st Floor, Mingde Main Building) Renmin University of China

Note: The theme of the hands-on session in this joint workshop is Formalizing Commutative Algebra.

Part I @ BICMR, PKU

Day 1 | April 29, 2025 (Tuesday)

09:30 - 10:30

Title: Formalizing Local Fields in Lean

Abstract: In this talk, I will discuss a joint work with M. I. de Frutos Fernández on the formalization of local fields. While some basic results on general valuation rings and normed fields have been in Mathlib for some time, this work introduces for the first time the notions of discrete valuation and local fields, connecting them to key results on discrete valuation rings. We crucially rely on recent work on the completion of Dedekind domains at prime ideals. As an application, we formalize the proof that Laurent series fields are the completion of rational function fields and propose an equivalent definition of p-adic numbers based directly on the p-adic valuation rather than the R-valued p-adic metric.

Speaker: Filippo Nuccio (Université Jean Monnet)

10:30 - 11:00 Tea Break

11:00 - 12:00

Title: The FLT-Regular Project

Abstract: In this talk, I will present a recently completed project formalizing the regular case of Fermat's Last Theorem in Lean 4. This classical 19th-century result played a pivotal role in the development of algebraic number theory. Our formalization includes a complete proof of Kummer's lemma, the main obstacle in the argument. Instead of relying on modern class field theory, we provide an alternative proof based on Hilbert's Theorems 90–94, which is more amenable to formalization. I will also discuss how this work contributes to the broader landscape of formalized algebraic number theory.

Speaker: Riccardo Brasca (Université de Paris Cité)

Day 2 | April 30, 2025 (Wednesday)

09:30 – 11:30 Formal Mathematics Lecture Title: Lie Ring Tactic Speaker: Jingting Wang(Peking University)

13:30 - 17:30 Hands-on Formalization Practice

Day 3 | May 1, 2025 (Thursday)

09:30 – 10:30 Math+AI Lecture Title: Developments in Math+AI Abstract: Recent years have seen growing interest in using AI for mathematical discovery. This talk explores some of these developments and highlights tools that may benefit working mathematicians.

Speaker: Ashvni Narayanan (University of Sydney)

10:40 - 11:40 Hands-on Formalization Practice

Day 4 | May 2, 2025 (Friday)

09:30 – 10:30 Formal Mathematics Lecture Title: Filtered Algebras and CM Rings Speaker: Nailin Guan (Peking University)

10:40 - 11:40 Hands-on Formalization Practice

Part II @ Mingli College / School of Mathematics, RUC

Day 5 | May 3, 2025 (Saturday)

09:30 – 10:30 Mathematics Special Lecture Title: Introduction to Condensed Mathematics Speaker: Shanwen Wang (Renmin University of China)

10:30 – 11:00 Tea Break

11:00 – 12:00 Formal Mathematics Special Lecture Title: Formalizing Foundational Concepts in Iwasawa Theory Speaker: Jinzhao Pan (Tongji University)

13:30 - 17:30 Hands-on Formalization Practice

Day 6 | May 4, 2025 (Sunday)

09:30 – 12:00 Formalization Seminar Title: Formalizing Game Theory Speakers: Zebei Li (Renmin University of China), Xintao Yu (Renmin University of China), Ashvni Narayanan (University of Sydney)

13:30 - 17:30 Hands-on Formalization Practice

Day 7 | May 5, 2025 (Monday)

09:30 – 11:30 Special Lecture on Formalizing Condensed Mathematics Speaker: Filippo Nuccio (Université Jean Monnet, France)

13:30 - 17:30 Hands-on Formalization Practice