UNIVERSITY AT ALBANY
State University of New York

College of Arts and Sciences
Department of Mathematics and Statistics

Analysis and Data Science Seminar

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From Checked Proofs to Reusable Mathematics: Lean, Mathlib, Autoformalization, and the Future of Mathematics

Tuesday, September 15, 2026
3:00 P.M. in Massry B008

Abstract. Lean is an interactive theorem prover and functional programming language in which mathematical statements are represented as types and proofs as terms inhabiting those types. In this talk, I will give a hands-on introduction to Lean and its mathematical library, Mathlib. Beginning with just enough dependent type theory to explain what Lean is doing, we will explore some of the basic objects involved: definitions, propositions, proof terms and tactics, and work through a few small examples together in the browser version of Lean. No previous experience with formal proof or programming will be assumed.

The second part of the talk will consider the rapidly developing interaction between formal mathematics and large language models. LLMs can now translate informal arguments into Lean, search for proofs, repair formalizations, and help navigate large libraries. But "formalization" is not a single standard. It ranges from rough, exploratory code that establishes that an argument can be made machine-checkable, through reliable project-specific

formalizations, to carefully designed, reusable mathematics that meets the standards of a library such as Mathlib. I will discuss what these different levels are for, why the distinction is important, and how a future workflow combining mathematicians, proof assistants, and AI may change the ways mathematics is discovered, verified, communicated, and preserved.