Alex Scheffelin

Curriculum Vitae
Columbia University Email: ams2637@columbia.edu

Interests

- **Algebraic Geometry**: Mixed characteristic problems, perfectoid techniques, deformation theory
- **Commutative Algebra**: Mixed characteristic problems, homological conjectures, perfectoid techniques, homotopical methods, prismatic cohomology, local cohomology

Education

- **University of Washington**: B.S. Mathematics *cum laude* 2022
- **Columbia University**: PhD (2022 - Current), MA in Mathematics (2023), MS in Mathematics (2026)
- **University of Tokyo**: Visiting Student, working with Shunsuke Takagi and Kazuma Shimomoto 2026

Honors/Awards

- **University of Washington**: *Outstanding Graduating Senior in Mathematics (B.S. Standard Major)*, 2021-2022

Research Experience

Preprints

1. **The Second Vanishing Theorem in Ramified Mixed Characteristc** I prove the last remaining case of the Second Vanishing Theorem for local cohomology in ramified mixed characteristic. https://arxiv.org/abs/2606.26867

Formalization of Mathematics

In Spring 2022 I was part of the first group in the XLL whose goal it was to formalize a proof of Hilbert's Basis Theorem in the lean theorem prover. I handled the part of the project which involved proving that the ascending chain condition for a ring is equivalent to the condition that each ideal be finitely generated.

Teaching Experience

- MATH UN4042 Intro to Modern Algebra II (TA), 2026 Fall, Columbia University
- MATH UN1201 Calculus III (TA), 2025 Fall, Columbia University
- MATH UN1201 Calculus III, 2025 Summer, Columbia University
- MATH UN1201 Calculus III (TA), 2025 Spring, Columbia University

- MATH UN1101 Calculus I, 2024 Fall, Columbia University
- Columbia SHP Group Theory and Number Theory 2024 Fall
- Math UN1201 Calculus III, 2024 Summer, Columbia University
- Math UN4041 Intro to Modern Algebra I (TA) 2024 Spring, Columbia University
- Math UN3025 Making, Breaking Codes (TA) 2023 Fall, Columbia University

Work Experience

Software Engineer *(2017 - 2018)*

From 2017 - 2018 I worked as a software engineer writing proprietary software for Visser Engineering, a structural engineering company. I worked in C# and handled the transfer of structural information and subsequent graphical visualization of said information. I used linear algebra, calculus, and computational geometry in order to handle various spatial transformations, calculation of intersections of polygons, etc. The work I did saved countless hours of work that structural engineers previously spent manually transferring data by hand which was prone to human error, and let them more effectively use their expertise on problems which a computer can not solve. This work led to our company gaining a significant competitive advantage in the market.

Seminars and Colloquia

- Joint Mathematics Meeting (JMM), AMS Special Session Homological Methods, Syzygies, and Resolutions in Commutative Algebra, January 13, 2027 Invited Speaker - The Second Vanishing Theorem in Ramified Mixed Characteristic
- University of Illinois Chicago, Algebra Geometry Seminar, November 9, 2026 Invited Speaker - The Second Vanishing Theorem in Ramified Mixed Characteristic
- University of Washington, Algebra and Algebraic Geometry Seminar, October 20, 2026 Invited Speaker - The Second Vanishing Theorem in Ramified Mixed Characteristic
- University of Michigan, Algebra Seminar, October 12, 2026 Invited Speaker - The Second Vanishing Theorem in Ramified Mixed Characteristic
- University of Utah, Commutative Algebra Seminar, September 25, 2026 Invited Speaker - The Second Vanishing Theorem in Ramified Mixed Characteristic
- University of Missouri, Algebra Seminar, September 14, 2026 Invited Speaker - The Second Vanishing Theorem in Ramified Mixed Characteristic
- Columbia University, Perfectoid Spaces Learning Seminar, 2022-2023 Academic Year (Organizer)
- Columbia University, Michael Zhao Memorial Colloquium, 2022-2023 Academic Year (Organizer)
- University of Washington, 1-2-3 seminar, February 2022

Service

- Assisted the GROW Conference at Columbia University - 2026
- Assisted the S. T. Yau High School Science Award Finals at Columbia University - 2026
- Editor for Columbia Journal of Undergraduate Mathematics - 2024
- Instructor for a course in the Columbia Science Honors Program on group theory and number theory - 2024
- Accompanying PhD mentor for Columbia's Paris Undergraduate Program (REU) - 2023
- DRP mentor for Commutative Algebra - 2023
- Judge for UW Math Olympiad - 2022
- University of Washington, 1-2-3 seminar, February 2022

Independent Study *(2019 - 2020, 2021-2022)*

In the winter and spring quarter of my Freshman (2018 - 2019) year I was a part of an accredited study group in abstract algebra that was formed to prepare for the graduate algebra sequence. In the following year another student and I continued this, working to register it as an official class (Math 398) and both worked as TAs / instructors for the course. Responsibilities include working with students to prepare their lectures for the class, creating problem sets, and in the spring due to COVID-19, running the lecture. Our goal was to provide an alternative to the undergraduate algebra sequence for those who could not register for it but who wished to take the graduate algebra sequence in the following year. It ran in the winter and spring quarter and covered the following topics. This became a recurring course at the University of Washington which I assisted with again in the 2021-2022 year.