# Matthew Hase-Liu

*Curriculum Vitae*

## Education

2021–2026 (expected) **Ph.D. in Math**, *Columbia University*, New York, NY.
Interests: Algebraic geometry and number theory. Advisor: Will Sawin.

2017–2021 **A.B./S.M. in Math/CS**, *Harvard College*, Cambridge, MA.

## Papers, Talks, Conferences, and Seminars

Publications and preprints

1. A converse to geometric Manin's conjecture for general low degree hypersurfaces, `https://arxiv.org/abs/2501.12506`, submitted.
2. Terminal singularities of the moduli space of curves on low degree hypersurfaces and the circle method (with Jakob Glas), `https://arxiv.org/abs/2412.14923`, submitted.
3. Non-smoothness of moduli spaces of curves on hypersurfaces (with Amal Mattoo), `https://arxiv.org/abs/2412.04618`.
4. A geometric approach to functional equations for general multiple Dirichlet series over function fields, `https://arxiv.org/abs/2405.18152`, to appear in **Algebra & Number Theory**.
5. A higher genus circle method and an application to geometric Manin's conjecture, `https://arxiv.org/abs/2402.10498`, to appear in **Algebra & Number Theory**.
6. Sum-product phenomena for planar hypercomplex numbers (with Adam Sheffer), **European Journal of Combinatorics**, Volume 89, Oct 2020, `https://arxiv.org/abs/1812.09547`.

Talks and posters

1. Johns Hopkins Algebraic Geometry Seminar, 04/26: TBD, invited talk.
2. AMS Spring Eastern Sectional, 03/26: TBD, invited talk.
3. UIC Algebraic Geometry Seminar, 02/26: *Bounding the singular locus of the moduli of curves on a hypersurface*, invited talk.
4. Stanford Number Theory Seminar, 01/26: *Unusual applications of analytic number theory to algebraic geometry*, invited talk.
5. University of Michigan Algebraic Geometry Seminar, 09/25: *Applications of analytic number theory to the geometry of moduli spaces*, invited talk.
6. Summer Research Institute in Algebraic Geometry, 07/25: *Moduli spaces of curves on low degree hypersurfaces and the circle method*, poster.
7. Institut Mittag-Leffler, 07/25: *Terminality of moduli spaces of curves on low degree hypersurfaces via the circle method I*, invited talk.

Talks and posters, continued

8. AMS New England Graduate Student Conference, 04/25: *The geometry of moduli spaces of curves on varieties via analytic number theory*, invited talk.
9. Tufts Algebra, Geometry, and Number Theory Seminar, 04/25: *Terminality of the moduli space of curves on low degree hypersurfaces and the circle method*, invited talk.
10. University of Maryland Number Theory and Representation Theory Seminar, 03/25: *Investigating singularities of moduli spaces with analytic number theory*, invited talk.
11. Philadelphia Area Number Theory Seminar, 10/24: *Geometric aspects of general multiple Dirichlet series over function fields*, invited talk.
12. Harvard–MIT Algebraic Geometry Seminar, 10/24: *A circle method for algebraic geometers*, invited talk.
13. Penn State Algebra and Number Theory Seminar, 04/24: *A higher genus circle method*, invited talk.
14. Enumerative Geometry and Arithmetic, 3/24: *A higher genus circle method and an application to geometric Manin's conjecture*, poster.
15. Monodromy and Its Applications, 12/23: *Functional equations for multiple Dirichlet series over function fields*, contributed talk.
16. Midwest Arithmetic Geometry and Number Theory Conference Series, 10/23: *The mapping space of a smooth projective curve to a smooth hypersurface of low degree*, poster.
17. Combinatorial and Additive Number Theory, 5/19: *Sum-product phenomena for planar hypercomplex numbers*, invited talk.

Conferences and workshops

1. AMS Spring Eastern Sectional, 03/26: *Topology and Arithmetic of Moduli Spaces of Curves*.
2. Summer Research Institute in Algebraic Geometry, 07/25.
3. Institut Mittag-Leffler, 07/25: *Full circle: 100 years of the circle method*.
4. AIM workshop, 04/25: *Moments in families of L-functions over function fields*.
5. AMS New England Graduate Student Conference, 04/25.
6. AIM workshop, 11/24: *Nilpotent counting problems in arithmetic statistics*.
7. Enumerative Geometry and Arithmetic, 3/24.
8. Monodromy and Its Applications, 12/23.
9. Midwest Arithmetic Geometry and Number Theory Conference Series, 10/23.
10. SLMath summer school, 7/23: *Introduction to derived algebraic geometry*.
11. Second JNT biennial conference, 7/22.
12. Anabelian days down in Georgia, 4/22.
13. PCMI summer school, 7/21: *Quadratic forms, Milnor K-theory, and arithmetic*.
14. Combinatorial and Additive Number Theory, 5/19.

Organized seminars

1. *Chabauty–Coleman's method*, learning seminar, Fall 2025.
2. *Exponential sums and equidistribution*, learning seminar, Spring 2025.
3. *Function field arithmetic and geometry*, learning seminar, Spring 2024.
4. *Cohomology and analytic number theory over function fields*, learning seminar, Fall 2022.
5. *Abelian reasons and a variety of examples to care about abelian varieties*, learning seminar, Spring 2022.
6. *DWIC: DG With Infty Categories Seminar*, learning seminar, Fall 2021.

## Awards

2025 PhD Candidate Recognition Award for Excellence in Teaching, Columbia University

2021 Fellowship Recipient, NSF Graduate Research Fellowship Program

2020, 2018 John Harvard Scholar, Harvard College Faculty of Arts and Sciences

2019 Certificate of Distinction in Teaching, Harvard University Derek Bok Center for Teaching and Learning

2018 Rank 107.5/4638, William Lowell Putnam Mathematical Competition

## Activities

2025, 2023 Graduate student mentor for Polymath Jr.

2025– Organizer for Directed Reading Program (DRP) at Columbia

2023– Graduate student editor for Columbia Journal of Undergraduate Mathematics

2023– Mentor for Directed Reading Program (DRP) at Columbia

2020 Co-founder and mentor for Mathematics Online Reading Program for High schoolers (MORPH)

2018–2021 Co-president of Harvard University Mathematics Association (HUMA)

2017–2019 Social chair of Harvard Gender Inclusivity in Mathematics

## Employment

2024 **Calculus I instructor**, *Columbia University*.

2021– **Teaching assistant**, *Columbia University*.

2019–2020 **Course assistant**, *Harvard College*.

2018 **Machine learning intern**, *Otter.ai*.

2017 **Software engineering intern**, *Otter.ai*.

## Computer Skills

Python, Java, C/C++, HTML/CSS/JavaScript, Linux, SageMath, Tensorflow, Git

## Languages

English **Native (U.S. citizen)**

Japanese **Fluent (Japanese citizen)**