

ALEX SHENG

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Personal webpage: <https://alexvhsheng.github.io/>

EDUCATION

University of Michigan

Aug. 2024 – Present

Ph.D. in Mathematics $\diamond$ Advisor: Daniel B. Forger

University of Chicago

Sept. 2020 – June 2024

B.A. in Mathematics with Honors

RESEARCH AND EXPOSITORY WRITINGS

Mathematics of AI $\diamond$ Mathematical Biology $\diamond$ Computational Neuroscience

$\circ$ *Performed Bach Trio Sonatas Reveal Topological Encoding of Polyphonic Music.* Research work. In preparation

$\circ$ *From the topology of natural images to Topological CNNs.* Expository talk. [PDF](#) Apr. 2026

Number Theory $\diamond$ Homotopy Theory $\diamond$ Representation Theory

$\circ$ *The S -unit equation using Lawrence-Venkatesh.* Expository writing. [PDF](#) Oct. 2025

$\circ$ *Kolyvagin systems.* Expository writing. [PDF](#) Oct. 2025

$\circ$ *Cofreeness of Lubin–Tate theory.* Expository writing. [PDF](#) Aug. 2023

$\circ$ *Power operations and HKR character theory.* Expository writing. [PDF](#) June 2023

$\circ$ *Elements of complex K -theory.* Expository writing. [PDF](#) Dec. 2022

$\circ$ *Complex multiplication of elliptic curves and abelian varieties.* Expository writing. [PDF](#) Aug. 2022

$\circ$ *On realizing rational and polynomial cohomology rings.* Expository writing. [PDF](#) Aug. 2021

CONFERENCES AND PROGRAMS

Arizona Winter School: Computational Aspects of Arithmetic Geometry and Cryptography Mar. 2026

IWoAT Summer School: Operads, Spectra, and Multiplicative Structures Aug. 2023

Park City Mathematics Institute Undergraduate Summer School: Quantum Computation July 2023

The University of Chicago Mathematics REU Summers, 2021 – 2023

Preliminary Arizona Winter School: Heights in Diophantine Geometry Nov. 2022 – Dec. 2022

Midwest Algebraic Geometry Graduate Conference Aug. 2022

SELECTED COURSEWORK

At the University of Michigan

- $\circ$ EECS 553 Machine Learning
- $\circ$ MATH 564 Topics in Mathematical Biology
- $\circ$ MATH 631-632 Introduction to Algebraic Geometry I-II
- $\circ$ MATH 637 Lie Groups
- $\circ$ MATH 776 Topics in Algebraic Number Theory

At the University of Chicago

- $\circ$ MATH 38511 Brownian Motion and Stochastic Calculus, Grade: A-
- $\circ$ MATH 37392 Arithmetic Geometry, Grade: A
- $\circ$ MATH 36206 Algebraic Number Theory, Grade: A

- MATH 31800 Topology and Geometry II (differential topology), Grade: A
- MATH 25700-25800 Honors Basic Algebra I-II
- MATH 20250 Abstract Linear Algebra, Grade: A
- STAT 38300 Measure-Theoretic Probability II, Grade A

TEACHING EXPERIENCE

At the University of Michigan

- Research Experience for Undergraduates (REU): transfer systems Summer 2026
- Directed Reading Program (DRP): differential Galois theory Summer 2025
- MATH 115 Calculus I ◊ Instructor Autumn 2024, Autumn 2025
- MATH 116 Calculus II ◊ Instructor Winter 2025, Winter 2026

At the University of Chicago

- MATH 24400 Introduction to Algebraic Geometry ◊ Reader Winter 2022
- MATH 25400 Basic Algebra II ◊ Super reader Autumn 2022, Winter 2022
- MATH 25500 Basic Algebra III ◊ Reader Spring 2022

Note: readers and super readers are teaching assistant positions.

MISCELLANEOUS

Music: I am a classically trained pianist and organist, and I perform regularly. Selected performances:

- Bach: Prelude and fugue in C minor, BWV 546. [YouTube](#)
- Bach: Prelude and fugue in E major, BWV 878. [YouTube](#)
- Franck: Chorale No. 3 in A minor. [YouTube](#)
- Medtner: Sonata-Reminiscenza from Forgotten Melodies, Op. 38 No. 1. [YouTube](#)

Languages: Native fluency in Mandarin and English. Learning German.

Citizenship: China.

Date of Birth: December 22, 2001.