

Shize Hao

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EDUCATION

Harvard University

Cambridge, MA

Visiting Undergraduate Student

Jan. 2024 – Dec. 2024

- GPA: 4.0/4.0
- Relevant coursework: Algebraic Vector Bundles and Motivic Homotopy Theory (Graduate-level), Recent Advances in Chromatic Homotopy Theory (Graduate-level), Étale Cohomology (Graduate-level), The Arithmetic of Elliptic Curves (Graduate-level), Number Fields, Algebraic Geometry.

Sichuan University

Chengdu, China

Bachelor of Science in Mathematics

Expected graduation: June 2025

- Major GPA: 3.97/4.0; Ranking: 3/124
- Relevant coursework: Algebraic Topology, Homological Algebra (Graduate-level), Differential Geometry and Topology, Differential Manifold, Mathematical Logic, Functional Analysis, etc.
- Honors and Awards: Sichuan University Comprehensive 2nd-Class Scholarship (2021-2022), Excellent Student of Sichuan University (2021-2022).

Research Interests

- Algebraic Topology, Geometry, and their interactions, with a particular focus on Algebraic K -Theory, Arithmetic Geometry, Equivariant Homotopy Theory, and Motivic Homotopy Theory.

RESEARCH EXPERIENCE

Algebraicity of Thom Spectra

Cambridge, MA

Individual Research / Advisor: Prof. Hopkins Jerome Michael & Dr. Ishan Levy

Apr. 2024 – Present

- Studied the algebraic properties of Thom spectra within the context of Equivariant Homotopy theory to determine a sufficient condition under which an equivariant Thom spectrum can be structured as an F_p -module valued Spectral Mackey functor;
- Conducted an in-depth study of foundational and advanced topics including Equivariant Homotopy theory, Equivariant Factorization Homology, Thom Spectra and Hopkins-Mahowald Theorem, and developed a deep understanding of the algebraic criteria required for the Thom spectrum's classification.

Étale Cohomology (Advanced Reading)

Cambridge, MA

Supervisor: Prof. Barry Mazur

Sept. 2024 – Dec. 2024

- Referenced *Lectures on Étale Cohomology* by J.S. Milne to study the foundational aspects of étale cohomology;
- Studied the fundamental theory (building blocks and basic properties) of étale cohomology, including étale morphisms, sites, and the six functor formalism in the context of étale sheaves;
- Gained familiarity with the computational aspects of étale cohomology

Algebraic K -theory (*Advanced Reading*)

Cambridge, MA

Supervisor: Dhilan Lahoti (Ph.D. Student)

Feb. 2024 – May 2024

- Studied recent papers on Algebraic K -theory, focusing on its universal construction, Topological Cyclic Homology, the Dundas-Goodwillie-McCarthy (DGM) trace theorem, and chromatically localized algebraic K -theory;
- Delivered a presentation named “Algebraic K -theory in a Nutshell” at the DRP symposium, giving a comprehensive overview of fundamental topics within Algebraic K -theory;
- Conducted a Zoom presentation on a modern proof of the DGM trace theorem, following Sam Raskin’s notes;
- Composed detailed notes on “The algebraic K -theory of the $K(1)$ -local sphere via TC ”.

Group Actions on Infinite Categories and Hochschild Cohomology

Chengdu, China

Independent Research

June. 2023 – Jan. 2024

- Conducted an extensive review of foundational texts, including J. Lurie’s Higher Topos Theory and Higher Algebra, to build the theoretical foundation;
- Established a formula that extends A. Perry’s work on Hochschild cohomology into the ∞ -categorical setting;
- Initiated efforts to generalize this formula within the framework of topological K -theory, exploring potential applications in algebraic topology and higher algebra.

Algebraic Geometry Seminar

Chengdu, China

Presenter / Instructor: Prof. Xiaojun Chen

Oct. 2022 – June 2023

- Read chapters about “Varieties, Schemes and Cohomology” of *Algebraic Geometry* (by R. Hartshorne) under Prof. Chen’s supervision to gain a deep understanding of foundational concepts in modern algebraic geometry;
- Explored the topics of varieties, schemes, and cohomology, and taught primary material and exercises from “Chapter 2: Schemes” to my fellow students;
- Expanded on the propositions in the textbook, providing additional context and background to enhance peers’ comprehension, and offered rigorous proofs for 90% of the exercises in Chapter 2 by researching through academic resources, including the Stacks Project, and integrated the materials into comprehensive explanations for fellow students.

EXTRACURRICULAR ACTIVITY

Sichuan University Mathematical Modeling Association

Chengdu, China

Vice President

Sept. 2022 – July 2023

- Coordinated on-campus mathematical modeling competitions, including China Undergraduate Mathematical Contest in Modeling (CUMCM) and Mathematical Contest in Modeling (MCM), and organized related lectures with an average attendance of 100 students per session.

SKILLS

Technical: Latex, PARI/GP, SageMath, MATLAB, Mathematica, C++

Languages: Native in Mandarin, and fluent in English