Kush Singhal

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EDUCATION:

PhD in Mathematics, Harvard University — 2022 - *ongoing*

Advisor: Mark Kisin

Bachelor of Science, University of Hong Kong, HK — 2018-2022

Major Mathematics (Intensive)

PAPERS:

- Near-miss Identities and Spinor Genus Classification of Ternary Quadratic Forms with Congruence Conditions, *pre-print*, Apr. 2021, *arXiv*:2104.08798 [math.NT] (accepted by the International Journal of Number Theory).
- The Completed L-function attached to the Weight 2 Polar Harmonic Maass Form $H^*_{N,z}(\tau)$, *pre-print,* Jan. 2022, *arXiv*:2201.03146 [math.NT] (submitted for review)
- Homotopy-Theoretic Approach to Iwasawa Theory, *in progress*
- Non-Triviality of Motivic Euler Systems, *in progress*

SELECTED TALKS:

- *Iwasawa Theory and K(1)-Local Homotopy Theory (October 2025)* Given for Harvard's Zygotop seminar
- *Non-Triviality of Euler Systems via Homotopy Theory (September 2025)* Given at the Harvard Number Theorists' seminar
- *The Nygaard Stack for Semi-Perfectoids (April 2025)* Given at the learning seminar on Prismatic F-Gauges
- *Explicit Reciprocity Laws via Prismatic Cohomology (September 2024)* Given at Harvard Number Theorists' seminar
- *Hodge-Tate Comparison in Mixed Characteristic (March 2024)* Given at the Prismatic learning seminar
- *A Climb Up the Tower (March 2024)* Given at the Trivial Notions seminar at Harvard
- Invited to give a 15-minute talk at Number Theory Days 2021 organized by the Department of Mathematics, HKU. My short presentation was based on my paper on

representations by ternary quadratic forms with congruence conditions. For more see: https://hkumath.hku.hk/~imr/event/HKUdays2021/program.php.

TEACHING:

Teaching Fellow, Department of Mathematics, Harvard *Every Fall Semester, 2023-2025*

I have been a teaching fellow for Math 1A (an introductory course in single variable calculus at Harvard). Due to the active learning format of this course, I was the sole instructor in my section. Apart from teaching every class for my section, my responsibilities also included holding office hours, and writing and grading exams.

2023 Summer Tutorial Program, Harvard *July 2023 – August 2023*

I taught a summer tutorial on the arithmetic theory of quadratic forms. I will design my own lectures as well as write my own lecture notes.

Mentor in Harvard Math's Directed Reading Program *Fall 2022 – ongoing*

I am a mentor in the directed reading program at Harvard. I work with undergraduate students one on one, while they learn about topics outside the usual undergraduate curriculum.

Student Teaching Assistant, Dept. of Mathematics, HKU *October 2020 – April 2022*

I conducted revision classes and Q&A sessions for second year courses, as well as answered queries that students emailed in, for the courses Intro to Mathematical Analysis (Fall 2020), Fundamentals of Mathematics (Spring 2021), and Abstract Linear Algebra (Spring 2022).

SELECTED ACTIVITIES AND POSITIONS HELD:

Organizational

- Organised the Harvard Number Theorists' Seminar at Harvard in Fall 2024 and Fall 2025. This is an internal seminar for students of Mark Kisin.
- Organising the Trivial Notions Graduate Student Seminar at Harvard for the academic year 2023-2024.

SELECTED HONOURS AND AWARDS

- B.Sc. Class of 1971 Prize offered by the Faculty of Science, HKU (2020-21), offered to the best third-year student from the physical sciences.
- Wong Yung Chow Prize in Mathematics offered by the Department of Mathematics, Faculty of Science, HKU (2020-21).
- Hong Kong University Alumni Award offered by the Faculty of Science, HKU (2020-21). This award is only offered to one third year undergrad from the Faculty of Science.
- Professor Yung-Chow Wong Scholarship offered by the Department of Mathematics, Faculty of Science, HKU (2019-20)
- Dean's Honours List, Faculty of Science, HKU (2018-19) (2019-20) (2020-21)