Wenqing Wei

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Education

The Chinese University of Hong Kong, Shenzhen — Shenzhen, China
B.S. in Mathematics and Applied Mathematics, Pure Mathematics Stream — Sep. 2020–Present

- Major GPA: 4.00/4.00, Ranking: 1/107
- Research interests: Number theory, representation theory, geometric Langlands program

University of California, Berkeley — California, U.S.A
Exchange Study in Department of Mathematics — Jan. 2023–Jun. 2023

- GPA: 4.00/4.00
- Obtained A+ on Lie groups (Prof. Edward Frenkel) and Commutative algebra (Prof. Richard E. Borcherds).

Seminars & Projects

Seminar on Automorphic Forms — Sep. 2023-present
Advisor: Prof. Caihua Luo

- Led the seminar and gave talks every week
- Studied advanced topics in modular forms such as modular forms of half integral weight, the Shimura correspondence, Hilbert modular forms, and Siegel modular forms
- Studied automorphic forms over $G(\mathbb{A}_K)$ and how to lift modular forms and Maass forms to automorphic forms over $\mathrm{GL}_2(\mathbb{A}_{\mathbb{Q}})$. Learned about how spherical Hecke algebra acting on smooth vectors gives arise to Hecke operators on modular forms.

Seminar on Minuscule Representations — Sep. 2023-present
Advisor: Prof. Jingsong Huang

- Studied chapter III to VI of R. M. Green's *Combinatorics of Minuscule Representations*. Learned about definitions and results about heaps. Studied the classification of generalized Cartan matrices and the classification of full heaps over untwisted affine Dynkin diagrams.

Course project on Lie groups — Jan. 2023-May 2023
Advisor: Prof. Edward Frenkel

- Wrote a paper *Opers and Center of Affine Kac-Moody Vertex Algebras*. Provided a detailed proof of the isomorphism between the space $\mathrm{Op}_G(D)$ and the direct sum of the space of projective connections and powers of differential sheaves. Discuss the isomorphism between the center of affine Kac-Moody vertex algebra and the function space of $\mathrm{Op}_G(D)$.
- Wrote a lecture note *Gaudin model, Center theorem, and Vertex algebras*. Discuss the commutativity of Gaudin Hamiltonians. Gave a detailed proof of the classical center theorem for $S(\hat{\mathfrak{g}}_-)$. Provided an intuitive introduction to vertex algebras. Studied the commutativity of Segal-Sugawara operators and the center theorem for $V_\kappa(\mathfrak{g})$.

Berkeley Direct Reading Program on Modular Forms — Jan. 2023-May 2023
Advisor: Sean Gonzales

- Studied modular forms with respect to congruence groups. Learned about correspondences between $\Gamma\backslash\mathbb{H}$ and moduli spaces of enhanced elliptic curves. Studied moduli curves as algebraic curves and algebraic definition of Hecke operators. Studied Galois representations associated to Abelian varieties and Hecke eigenforms
- Wrote a paper *Modular forms and Hecke operators*.

Group reading on Tate's thesis Jun. 2022

- Studied integration and Fourier transform on local fields and Adele rings. Learned about local zeta integrals and their functional equations. Used methods above to give a proof of analytic continuation and functional equations of Dedekind zeta functions and Dirichlet series
- Wrote a paper *Fourier transform over adele rings and its application*

Self-studied on geometric Langlands program

"Langlands Program and QFT" by Edward Frenkel, video records (2012, Columbia University)

- Studied the statement of geometric Langlands conjecture in analogy with the classical Langlands program. Studied Deligne's construction of Hecke eigensheaves on $\mathrm{Pic}(X)$
- Learned about the construction of Hecke eigensheaves due to Beilinson and Drinfeld based on the idea of 2D CFT. Studied the categorical representation $\mathcal{C}_\chi$ of loop group $G((t))$ parametrized by $\chi \in \mathrm{Op}_G(D^\times)$ with a unique spherical object V_χ. Learned that the localization $\Delta(V_{\chi_x})$ gives arise to either 0 or a D-module on Bun_G which is a Heck eigensheaves with eigenvalue corresponds to χ_x. Learned that fibers of $\Delta(V_{\chi_x})$ are spaces of coinvariant

"Lecture on Geometric Langlands" by David Ben-Zvi, video records (2007, Oxford University)

- Studied the geometric Langlands program based on the viewpoint that it is Fourier transform for sheaves on Bun_G. Learned about geometric function theory and correspondence, which unifies ideas behind many examples such as Fourier Mukai transform
- Learned about basic definition in topological field theory and how structures of geometric Langlands emerge in this field.

Published writing

- Wenqing Wei. (2022). *Congruence Problems in Number Sequences*, Mathematical Olympiad Expert Lectures, Zhejiang University Press. Electronic version (in Chinese), Contents (in English).

Honors & Awards

- Shing-Tung Yau College Student Mathematics Contest:
  Bronze Medal in Algebra and Number Theory (Top 10 in China) 2022
- University Academic Performance Scholarship: First Class 80000 RMB (Top 2 in school) 2022
- Candidate for National Scholarship (Top 4 in school) 2022
- National College Student Mathematical Modeling Competition, Guangdong Division, Outstanding Award 2021
- University Academic Performance Scholarship: Third Class 20000 RMB 2021
- Dean's list of School of Science and Engineering 2021,2022,2023
- First Prize in the National High School Mathematics Competition, Zhejiang Division 2019

Teaching activity

- **MAT2041 Linear Algebra and its Applications** Fall 2022
  University Student Teaching Fellow. Taught tutorial every week, assisted in preparing midterm and final exam papers, and helped organize Lecture notes.

Academic services & Volunteering

- The Second National Conference on Information Communication Mathematics and Applications — Nov. 2023
  Arranged conference process, dealt with paper materials.
- Liuhui Laboratory Inauguration Ceremony and the First Mathematics and Applied Research Seminar — Oct. 2023
  Volunteer. Receiving visitors.
- Gave a talk about Galois theory on the closing ceremony of University Math π event. PPT. — Aug. 2021
- Volunteer at the freshman orientation meeting of School of Mathematics and Applied Mathematics. — Aug. 2021