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: 1/104
- 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

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 Feigin-Frenkel isomorphism and its consequences
- 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 $V_{\kappa_c}(\mathfrak{g})$

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-Jul. 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*

Selected Study experience

2023 Summer School on Algebra and Number Theory at AMSS, Chinese Academy of Sciences

- Attended three week courses with topics in algebraic number theory (Prof. Jingren Chi), representation theory (Prof. Chen Wan), and algebraic geometry (Prof. Shizhang Li).

"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 1 in school) 2021,2022
- Candidate for National Scholarship (Top 4 in school) 2022
- National College Student Mathematical Modeling Competition, Guangdong Division, Outstanding Award 2021
- Dean's list of School of Science and Engineering 2021,2022,2023

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