Gyujin Oh

Basic Information

· Address: 517 Mathematics, MC 4406, 2990 Broadway, New York, NY 10027
· Phone: 212-853-8261 (Office) 609-955-8599 (Mobile)
· Email: gyujinoh@math.columbia.edu
· Website: https://math.columbia.edu/~gyujinoh/
· South Korean National; U.S. Permanent Resident.

Research Interests

Number theory, algebraic geometry, p-adic/complex analytic geometry, and representation theory.

Employment

Columbia University, New York, NY

J. F. Ritt Assistant Professor, 2022–.

Mathematical Sciences Research Institute (MSRI), Berkeley, CA

MSRI Postdoctoral Fellow, *Algebraic Cycles, L-Values, and Euler Systems*, Spring 2023.

Education

Princeton University
Ph.D. in Mathematics, 2017–2022.
Advisors: Akshay Venkatesh, Christopher Skinner.
Thesis: Arithmetic of Higher Coherent Cohomology of Shimura Varieties.

Trinity College, University of Cambridge
M.A.St. in Pure Mathematics (Part III), with Distinction. 2016–2017.

Stanford University
B.S. in Mathematics with Honors, Minor in Computer Science. 2010–2016.
On leave 2012–2014 for the compulsory military service in South Korea.

Books

1. **An Invitation to Modern Algebraic Number Theory.**
Based on the lecture notes for the undergraduate algebraic number theory (Spring 2024, Columbia).
World Scientific, in editorial revisions, 250 pp.

Research Articles

8. **Generalized Whittaker models beyond $\mathfrak{sl}_2$-triples**.
submitted, 37 pp, 2025.

7. **Moduli stacks of crystals and isocrystals**.
with Koji Shimizu.
submitted, 111 pp, 2025.

6. **Theta characteristics and modular forms of weight one**.
Pure Appl. Math. Q. **21** (2025), no. 6, 2187-2228.

5. **Coherent cohomology of Shimura varieties, motivic cohomology, and archimedean L-packets**.
submitted, 40 pp, 2023.

4. **Higher Koecher's principle, harmonic Hilbert Maass forms and their Borcherds lift**.
preprint, 20 pp, 2023.

3. **A proof of Néron–Ogg–Shafarevich criterion via its archimedean analogue**.
submitted, 6 pp, 2025.

2. **Brauer Obstructions of Finite Groups of Lie Type in View of the Local Langlands Correspondence**.
Bachelor's Thesis, Stanford University, 2016.

1. **On the distribution of cyclic number fields of prime degree**.
with Seok Hyeong Lee.
Int. J. Number Theory **8** (2012), no. 6, 1463-1475.

Honors

· Junior Faculty Recognition Award for Excellence in Teaching, AY 2024-25.

· Centennial Fellowship, Princeton University (2017–2021).

· Trinity Studentship in Mathematics, Trinity College, Cambridge (2016–2017).

· Firestone Medal for Excellence in Undergraduate Research (2016).

· Putnam Fellow, William Lowell Putnam Competition (2016).

· Gold Medal, International Mathematical Olympiad (IMO) (2008).

Undergraduate Advising

· Zhaocheng Dong, Gabriel Fernandez, Katherine Mekechuck, Xiaohua Wei.
Columbia Math REU, Summer 2023.
Topic: Transcendence and number theory.
As a result of the REU, the group produced the following manuscript.

– Zhaocheng Dong, Gabriel Fernandez, Katherine Mekechuck, Rafar Hajjar Munoz, and Xiaohua Wei. **A refined Siegel–Shidlovskii theorem for arithmetic Gevrey series of negative order**. 2023.

· Analisa Faulkner Valiente.
Summer Research Initiative, Barnard College, Summer 2023.
Topic: Sphere packing problem in dimension 8.

· Margaret Meyerson.
Senior Thesis. 2023-24. Awarded the Departmental Honors.
Title: Three Approaches to Transcendence Proofs: Diophantine Approximation, Algebraization, and Differential Equations.

· Pranav Konda.
Summer Research, Rabi Scholars, Columbia University, Summer 2025.
Topic: Periods of Hilbert modular forms over Teichmuller curves.

Teaching

· Columbia

– Instructor for MATH UN1201 (Calculus III) in Fall 2022, Fall 2023, Fall 2024, Fall 2025.

– Instructor for MATH GU4043 (Algebraic Number Theory) in Spring 2024, Spring 2026.

– Instructor for MATH GR6657 (Graduate Algebraic Number Theory) in Spring 2025.

· Princeton

– Instructor for MAT 104 (Calculus II) in Spring 2020.

– Preceptor for MAT 103 (Calculus I) in Fall 2021.

Experiences & Services

- Refereed for journals, including *Algebra and Number Theory*, *Journal of European Mathematical Society*, and *Quarterly Journal of Mathematics*.
- Served on 4 Ph.D. qualifying exam committees.
- Organized various seminars.
  - Relative Langlands duality seminar (Spring and Fall 2024, with Qiao He).
  - Automorphic Forms and Arithmetic Seminar (2023–2024, with Amadou Bah, Eric Urban).
  - Moduli of Langlands parameters (Fall 2021)
  - Princeton Junior Number Theory Tea (Spring 2020–Spring 2021)
  - Higher Hida theory (Fall 2020, with Shilin Lai)
  - Theta correspondence (Fall 2019, with Shilin Lai)
  - Deformation theory and cotangent complexes (Fall 2018, with Mohan Swaminathan)
- Commissioner of Team US for IMO 2020.
- Republic of Korea Air Force, Sergeant (2012–2014).

Invited Research Presentations

- 2026:
  - Princeton University/IAS, Arithmetic Geometry Seminar, January 2026.
  - 4 lectures in Lectures on p-adic geometry, Seoul National University, January 2026.
- 2025:
  - University of Cambridge, Number theory seminar, November 2025.
  - University of Minnesota–Twin Cities, Arithmetic and Representation Theory seminar, October 2025.
  - University of Pennsylvania, Math-Physics seminar, September 2025.
  - Samsung Global Research Symposium: Arithmetic and Automorphic forms, June 2025: *Moduli stack of isocrystals and counting local systems.*
  - University of Illinois Chicago, Unlikely intersections seminar, April 2025: *Moduli stack of isocrystals and counting local systems.*
  - University of Chicago, Number theory seminar, February 2025: *Derived Hecke action for weight one forms via classicality.*
  - UC San Diego, Number theory seminar, February 2025: *Moduli stack of isocrystals and counting local systems.*
  - UC Berkeley, Arithmetic geometry and number theory seminar, February 2025: *Moduli stack of isocrystals and counting local systems.*
- 2024:
  - MIT, Number theory seminar, December 2024: *Derived Hecke action for weight one forms via classicality.*
  - Ramification in geometric Langlands and non-abelian Hodge theory, Heidelberg, Germany, September 2024: *Derived structures on the arithmetic Langlands program via obstruction to geometricity* (poster).
  - Arithmetic Theta Series and p-adic Modular Forms, Cetraro, Italy, June 2024: *A cohomological approach to harmonic Maass forms.*

- Princeton University/IAS, Number theory seminar, May 2024: *Derived Hecke action for weight one modular forms via classicality.*
- UCLA, Number theory seminar, April 2024: *Derived Hecke operators for weight one forms via classicality.*
- POSTECH, January 2024: Lecture series on the derived aspects of the Langlands program.

· 2023:

- Johns Hopkins University, Number theory seminar, October 2023: *Degenerate, Generalized, and Reduced Whittaker models.*
- AMS Eastern Sectional Meeting at SUNY Buffalo, Homological aspects of p-adic groups and automorphic representations, September 2023: *Homological aspects of Whittaker models.*
- SLMath (formerly known as MSRI), ES Program Seminar, March 2023: *On the peculiarities of weight one modular forms.*

· 2022:

- POSTECH, Number theory seminar, South Korea, November 2022: *A cohomological approach to harmonic Maass forms* (virtual).
- Harvard University, Number theory seminar, November 2022: *Cohomological degree-shifting operators on Shimura varieties.*
- 2022 Global KMS International Conference, October 2022: *Drinfeld level structures via prismatic Dieudonne theory* (virtual).
- UT Austin, Number theory seminar, October 2022: *Cohomological degree-shifting operators on Shimura varieties.*
- KAIST, Number theory seminar, South Korea, July 2022: *Cohomological degree-shifting actions on locally symmetric spaces.*
- QSMS Workshop, South Korea, June 2022: *Cohomological degree-shifting actions on locally symmetric spaces.*
- Seoul National University, Number theory seminar, South Korea, June 2022: *Arithmetic local systems over the moduli space of curves.*
- UC San Diego, Number theory seminar, May 2022: *A cohomological approach to harmonic Maass forms.*
- University of Wisconsin, Madison, Number theory seminar, May 2022: *A cohomological approach to harmonic Maass forms* (virtual).
- University of Michigan, RTG Number theory seminar, April 2022: *Degree-shifting action and L-packets.*
- Columbia University, Automorphic forms and Arithmetic seminar, March 2022: *Coherent cohomology of Shimura varieties, motivic cohomology, and L-packets.*
- Seoul National University, Number theory seminar, South Korea, January 2022: *Local cohomology of Hilbert modular varieties and harmonic Hilbert Maass forms.*

· 2021:

- Seoul National University, Number theory seminar, South Korea, December 2021: *Arithmetic geometry and representation theory of harmonic Maass forms.*
- London–Warwick Euler systems seminar, November 2021: *Higher Hida theory and the p-adic L-function for* $\mathrm{U}(2,1)$ (virtual).
- UC Berkeley, RTG Arithmetic geometry and number theory seminar, October 2021: *Coherent cohomology of Shimura varieties, motivic cohomology and period integrals.*

Invited Conferences/Workshops

- Lectures in p-adic geometry, Seoul National University, January 2026.
- Samsung Global Research Symposium, June 2025.
- Moduli of Higgs bundles and the Langlands program, Simons Center for Geometry and Physics, Stony Brook, July 2024
- AIM Workshop on Analytic, Arithmetic, and Geometric Aspects of Automorphic Forms, Caltech, Pasadena, CA, 2024
- Isogeny Graphs in Cryptography, BIRS, Banff, 2023
- The Arithmetic of the Langlands Program, HIM, Bonn, 2023
- Arithmetic Aspects of Deformation Theory, BIRS, Banff, 2023
- Sparsity of Algebraic Points, Summer Graduate School, MSRI, Berkeley, 2021
- Arbeitsgemeinschaft: Derived Galois Deformation Rings and Cohomology of Arithmetic Groups, Oberwolfach, Germany, 2021
- Geometric Realizations of Jacquet–Langlands Correspondences, AIM, San Jose, 2019