

Seewoo Lee

Ph. D. in Mathematics

University of California Berkeley, US

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Education

University of California Berkeley

Ph.D in Mathematics

Berkeley

2018 – 2026

- Thesis: Positive Quatimodular Forms and Linear Programming Bounds
- Advisor: Sug Woo Shin
- On leave for military service (2019 Fall - 2022 Summer)

Pohang University of Science and Technology (POSTECH)

M.S in Mathematics

Pohang

2017 – 2018

- Thesis: *Maass wave forms, quantum modular forms and Hecke operators*
- Advisor: YoungJu Choie

Pohang University of Science and Technology (POSTECH)

B.S. in Mathematics

Pohang

2013 – 2017

- *Summa Cum Laude* with top honours in mathematics
- Honor's thesis: *Quantum modular forms and Hecke operators*

Experiences

Axiom Math

Internship

Palo Alto

2026.01 – 2026.04

- Machine Learning & AI for Mathematical Discovery and Reasoning

CryptoLab

Research Engineer

Seoul

2021.05 – 2022.07

- Research on Homomorphic Encryption and application in Machine Learning

Riuid!

Research Scientist

Seoul

2019.07 – 2021.05

- Research on Knowledge Tracing, Score Prediction, Student Dropout Prediction, Item Recommendation

Research Interests

- Computational Number Theory, Automorphic Forms and Representations, Relative Langlands Program
- AI for Mathematics, Formalization of Mathematics, Homomorphic Encryption

Publications

• Math

1. S. Hariharan, C. Birkbeck, **S. Lee**, G. Ma, B. Mehta, A. Poiroux, M. Viazovska, *Progress in Formalizing Sphere Packing in Dimension 8*, To appear in Proceedings of International Conference on Mathematical Software 2026, arXiv:2604.23468
2. **S. Lee**, *Algebraic proof of modular form inequalities for optimal sphere packings*. To appear in Algebra Number Theory, arXiv:2406.14659
3. D. Angdinata, E. Chen, **S. Lee**, K. Ono, J. Zhang, *ABC implies that Ramanujan's tau function misses almost all primes*, To appear in Indag. Math., arXiv:2603.29970
4. **S. Lee**, *Shanks bias in function fields*, To appear in J. Théor. Nombres Bordeaux, arXiv:2509.16142
5. G. Bates, R. Jesubalan, **S. Lee**, J. Lu, H. Shim, *Powerful Fibonacci polynomials over finite fields*, To appear in Finite Fields and Their Applications, arXiv:2601.02664
6. E. Chen, K. Lau, **S. Lee**, K. Ono, J. Zhang, *Almost all primes are partially regular*, Arch. Math. (2026)
7. K. Lee, **S. Lee**, *Machines Learn Number Fields, But How? The Case of Galois Groups*, Res. Math. Sci. 13, 60 (2026)
8. J. Baek, **S. Lee**, *An equilateral triangle of side $> n$ cannot be covered by $n^2 + 1$ unit equilateral triangles homothetic to it*, Amer. Math. Monthly, 1-9 (2024)
9. D. Choi, **S. Lee**, *Non-archimedean Sendov's conjecture*, p-Adic Numbers Ultrametric Anal. Appl. 14, 77-80 (2022)
10. **S. Lee**, *Maass wave forms*, *Quantum Modular Forms and Hecke Operators*, Res. Math. Sci. 6, 7 (2018), Modular Forms are Everywhere: Celebration of Don Zagier's 65th Birthday
11. **S. Lee**, *Quantum Modular Forms and Hecke Operators*, Res. Number Theory 4, 18 (2018)
12. Y. Chen, R. Chernov, M. Flores, M. F. Bourque, **S. Lee**, B. Yang, *Toy Teichmüller spaces of real dimension 2: the pentagon and the punctured triangle*, Geom. Dedicata 197 (2018), 193-227

• Others

1. F. Lin, K. Nagel, **S. Lee**, J. Jiang, G. Yang, P. Chang, S. Li, N. Sheu, *An Analysis of Silk Density in Spider Webs*, R. Soc. Open Sci. 12: 250455 (2025)
2. **S. Lee**, G. Lee, J. Kim, J. Shin, M. Lee, *HETAL: Efficient Privacy-preserving Transfer Learning with Homomorphic Encryption*, International Conference on Machine Learning. 2023 (Oral, 155/6538)
3. **S. Lee**, J. Kim, *Revisiting the Convergence Theorem for Competitive Bidding in Common Value Actions*, Econ. Theory Bull. 10, 293-302 (2022)
4. **S. Lee**, K. Kim, J. Shin, J. Park, *Tracing Knowledge for Tracing Dropouts: Multi-Task Training for Study Session Dropout Prediction*, Educational Data Mining. 2021
5. M. Kim, Y. Shim, **S. Lee**, H. Loh, J. Park, *Behavioral Testing of Deep Knowledge Tracing Models*, Educational Data Mining 2021
6. H. Loh, D. Shin, **S. Lee**, J. Baek, C. Hwang, Y. Lee, Y. Cha, S. Kwon, J. Park and Y. Choi, *Recommendation for Effective Standardized Exam Preparation*, LAK21: 11th International Learning Analytics and Knowledge Conference. 2021
7. D. Shin, Y. Shim, H. Yu, **S. Lee**, B. Kim, Y. Choi, *SAINT+: Integrating Temporal Features for EdNet Correctness Prediction*, LAK21: 11th International Learning Analytics and Knowledge Conference. 2021

8. Y. Choi, Y. Lee, D. Shin, J. Cho, S. Park, **S. Lee**, J. Baek, C. Bae, B. Kim, J. Heo, *EdNet: A Large-Scale Hierarchical Dataset in Education*, International Conference on Artificial Intelligence in Education (2021), 69-73
9. J. Kim, **S. Lee**, *Joint Liability and Stochastic Shapley Value*, Int. Rev. Law Econ. 60 (2019), 1-8

Preprints

1. K. Lau, **S. Lee**, K. Ono, *Formalized q-series: The Rogers-Ramanujan Identities and Beyond*, arXiv:2607.01544, submitted
2. **S. Lee**, B. Hwang, H. Lim, J. Hyun, I. Choi, Y. Park, J. Baek, H. Hong, K. Lee, J. Heo, H. Baik, C. Lee, K. Lee, *Lean-GAP: A Dataset of Formalized Graduate Algebra Problems* arXiv:2606.02588, submitted
3. G. Bates, R. Jesubalan, **S. Lee**, J. Lu, H. Shim, *Ties in function field prime race*, arXiv:2603.21005, submitted
4. **S. Lee**, *Inequalities involving polynomials and Quasimodular Forms*, arXiv:2602.10536, submitted
5. E. Chen, K. Lau, **S. Lee**, K. Ono, J. Zhang, *Dead ends in square-free digit walks*, arXiv:2602.05095
6. J. Getz, A. G. Terradillos, F. Hosseinijafari, B. Hu, **S. Lee**, A. Slipper, M.-H. Tomé, H. Yao, A. Zhao, *Modulation groups*, arXiv:2510.23932, submitted
7. J. Baek, **S. Lee**, *Formalizing Mason–Stothers Theorem and its Corollaries in Lean 4*. arXiv:2408.15180
8. **S. Lee**, Y. Choi, J. Park, B. Kim, J. Shin, *Consistency and Monotonicity Regularization for Neural Knowledge Tracing*, arXiv:2105.00607
9. Y. Choi, Y. Lee, J. Cho, J. Baek, D. Shin, H. Yu, Y. Shim, **S. Lee**, J. Shin, C. Bae, B. Kim, J. Heo, *Assessment Modeling: Fundamental Pre-training Tasks for Interactive Educational Systems*, arXiv:2022.05505

Awards, Grants & Honours

Nikki Kose Memorial Teaching Prize, Dept. of Mathematics, UC Berkeley	2026 Spring
Department of Mathematics Summer Grant, UC Berkeley	2024 Summer
Outstanding Graduate Student Instructor Award, UC Berkeley	2024 Spring
Graduate Student Researcher, UC Berkeley	2023 Spring, Summer
Kwanjeong Educational Foundation Scholarship, KEF	2017–2018
Excellency Award (Top Honours), Dept. of Mathematics, POSTECH	2017
POSTECH Outstanding Talent Development Scholarship, POSTECH	2013–2016
National Science and Technology Scholarship, KOSAF	2013–2016
Silver medals, Undergraduate Mathematical Competition, KMS	2013, 2015, 2016
31st place, ACM-ICPC Daejeon Regional, ACM	2015
Grand prize, POSTECH Programming Contest, Dept. of Computer Science, POSTECH	2015
Honorable mention, Korean Olympiad of Informatics, NIA	2012

Teaching Experience

Graduate Student Instructor (T.A.)

UC Berkeley

Berkeley
2019 – Present

- (2026 Spring) Multivariable Calculus
- (2025 Fall) Introduction to Abstract Algebra
- (2025 Spring) Cryptography
- (2025 Spring) Introduction to Mathematical Logic
- (2024 Fall) Abstract Linear Algebra
- (2024 Spring) Methods of Mathematics: Calculus, Statistics, and Combinatorics
- (2023 Fall) Methods of Mathematics: Calculus, Statistics, and Combinatorics
- (2022 Fall) Multivariable Calculus
- (2019 Spring) Methods of Mathematics: Calculus, Statistics, and Combinatorics

Grader & T.A.

POSTECH

Pohang
2016 – 2018

- (2018 Spring) Differential Manifolds and Lie groups (Graduate course)
- (2017 Fall) Modern Algebra II
- (2017 Spring) Calculus
- (2016 Fall) Applied Linear Algebra (Undergraduate T.A.)

Tutoring

POSTECH

Pohang
2014 – 2015

- (2015 Spring) Calculus
- (2015 Spring) Modern Algebra I
- (2014 Fall) Analysis II
- (2014 Spring) Analysis I

Outreach**KIAS Thematic Program on AI and Mathematics**

Coordinator for week 2: Number Theory

Seoul
2026 Summer

- Organized a week-long program on Number Theory and AI

KIAS Winter School on Mathematics and AI

Team Leader

Jeongseon
2025 Winter

- Use machine learning to study Artin representations and abelian varieties over finite fields
- Members: Dohoon Choi, Keunyoung Jeong, Jaehak Yi, Minseo Shin, Euntaek Lee, Taeyoung Kim

Berkeley Math REU

Mentor

Berkeley
2025 Summer

- Diophantine equations on Fibonacci polynomials and ties in Chebyshev bias over finite fields
- Mentees: Graeme Bates, Ryan Jesubalan, Jane Lu, Hyewon Shim

Directed Reading Program

Mentor

Berkeley
2023-present

- (2025 Fall) Group cohomology (Graeme Bates, Jane Lu)
- (2025 Spring, 2025 Fall) Modular forms (Dongho Kim)
- (2023 Fall) Elliptic curves (Jacob Martin)
- (2023 Spring) p -adic numbers (Lucas Xie)

- Mentoring high school students for college-level mathematics

Talks

- Research Talks

- Thematic Program on AI and Mathematics, KIAS, Seoul, July 2026
Formalized q -series
- BRL-AGSTA One-day Workshop, DGIST, Daegu, July 2026
Machine Learning Number Theory
- Mathematics x AI: Challenges and Opportunities, KIAS, Seoul, July 2026
Machine Learning Number Theory
- Workshop on Algebraic Geometry and Machine Learning, ICARM, Pittsburgh, June 2026
Machine Learning Number Theory
- Graduate School of AI for Math, KAIST, Daejeon, June 2026
Positive Quasimodular Forms and Linear Programming Bounds
- Mathematics Colloquium, Carnegie Mellon University, Pittsburgh, April 2026
Positive Quasimodular Forms and Linear Programming Bounds
- Aarhus Mathamtics & AI Workshop, Aarhus Institute of Advanced Studies, Aarhus, January 2026
How Machines Learn Galois Groups
- Lean Together 2026, Online, January 2026
Progress on the Sphere Packing Project (with Sidarth Hariharan and Chris Birkbeck)
- June E Huh Center for Mathematical Challenges, KIAS, Seoul, January 2026
Positive Quasimodular Forms and Linear Programming Bounds
- Number Theory Seminar, University of Wisconsin-Madison, Wisconsin, December 2025
How Machines Learn Galois Groups
- EPFL, Lausanne, November 2025
Sphere Packing, Sign Uncertainty Principle, Universal Optimality, and Positive Quasimodular Forms
- Aarhus University, Aarhus, November 2025
Sphere Packing, Sign Uncertainty Principle, Universal Optimality, and Positive Quasimodular Forms
- Special Seminar, Carnegie Mellon University, Pittsburgh, November 2025
How Machines Learn Galois Groups
- International Seminar on Automorphic Forms, Online, April 2025
Algebraic proof of modular form inequalities for optimal sphere packings
- RTG seminar, UC Berkeley, Berkeley, February 2025
Algebraic proof of modular form inequalities for optimal sphere packings
- Algebra Discrete Math seminar, UC Davis, Davis, January 2025
Algebraic proof of modular form inequalities for optimal sphere packings
- 6th EU/US Workshop on Automorphic Forms and Related Topics, Luminy, September 2024
Algebraic proof of modular form inequalities for optimal sphere packings
- POSTECH Number Theory Seminar, POSTECH, Pohang, May 2024
Algebraic proof of modular form inequalities for optimal sphere packings

- Student Number Theory Seminar, UC Berkeley, Berkeley, April 2024
Algebraic proof of Viazovska’s inequalities
- School of Mathematics, KIAS, Seoul, December 2023
A new proof of Viazovska’s modular form inequality and beyond
- International Conference on Machine Learning, Hawaii, US, July 2023
HETAL: Efficient Privacy-preserving Transfer Learning with Homomorphic Encryption
- Center for Artificial Intelligence and Natural Sciences, KIAS, Seoul, June 2023
HETAL: Efficient Privacy-preserving Transfer Learning with Homomorphic Encryption
- School of Computing, KAIST, Daejeon, June 2023
HETAL: Efficient Privacy-preserving Transfer Learning with Homomorphic Encryption
- 1st FHE.org workshop, Trondheim, May 2022
Encrypted Multinomial Logistic Regression Training with Softmax Approximation
- Workshop for Young Mathematicians in Korea, Online, January 2022
Hitchhiker’s guide to non-archimedean world
- Graduate student seminar, Sogang University, Seoul, July 2018
Maass wave forms, quantum modular forms and Hecke operators
- Sungkyunkwan University, Seoul, June 2018
Maass wave forms, quantum modular forms and Hecke operators
- NCTS-POSTECH Number Theory Workshop, NTU, Taiwan, December 2017
Quantum modular forms and Hecke operators
- Expository Talks
 - Korea University, Seoul, June 2026
Mathematics, AI, and Formalization
 - Student Number Theory Seminar, Berkeley, March 2026
Mathematics, AI, and Formalization
 - Harmonic Analysis Seminar, University of California Irvine, February 2026
Mathematics, AI, and Formalization
 - Student Number Theory Seminar, Berkeley, August 2025
How Do Automorphic Forms and Elliptic Curves Fly? (Survey on Murmuration)
 - Bruhat-Tits building seminar, Berkeley, February 2025
Bruhat-Tits buildings for split groups / Moy-Prasad filtration and Local Langlands correspondence
 - Berkeley–Stanford Number Theory Learning Seminar, Berkeley, December 2024.
Proof of irrationality of $L(2, \chi_{-3})$ and product of log values
 - Student Number Theory Seminar, Berkeley, October 2024
Modular forms on G_2
 - Geometric class field theory learning seminar, Berkeley, Sep 2024
Singular algebraic curves and de-normalization
 - Student Number Theory Seminar, Berkeley, March 2024
Linear Programming Beyond Sphere Packing
 - Orbit methods and automorphic forms learning seminar, Berkeley, Oct 2023
Gan–Gross–Prasad conjectures
 - Student Number Theory Seminar, Berkeley, Nov 2022
Shimura correspondence and Waldspurger’s formula

- Instructional Workshop on Class Field Theory, KIAS, Seoul, January 2018
Proof of the main theorem of local class field theory

Languages

- Korean (native), English (fluent)
- Python (PyTorch, Numpy, Pandas), C/C++, $\text{\LaTeX}$, SageMath, Lean, MATLAB, Haskell

Miscellaneous (click the icons)

- Working as a reviewer for Mathematical Reviews (2022~) 
- GitHub blog on various topics 
- Math Stackexchange  & Math Overflow 
- Speedcuber 
- DJ (Techno, Trance, House)  

(Last updated: July 21, 2026)