# Seewoo Lee

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## Education

**University of California Berkeley** — Berkeley
Ph.D in Mathematics — 2018 – Present

- On leave for military service (2019 Fall - 2022 Summer)
- Advisor: Sug Woo Shin

**Pohang University of Science and Technology (POSTECH)** — Pohang
M.S in Mathematics — 2017 – 2018

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

**Pohang University of Science and Technology (POSTECH)** — Pohang
B.S. in Mathematics — 2013 – 2017

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

## Experiences

**CryptoLab** — Seoul
Research Engineer — 2021.05 – 2022.07

- Research on Homomorphic Encryption and application in Machine Learning

**Riiid!** — Seoul
Research Scientist — 2019.07 – 2021.05

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

## Research Interests

- Number theory, Automorphic Forms and Representations, Analytic Number Theory, Algebraic Number Theory, Relative Langlands Program
- Deep learning, Natural Language Processing, Homomorphic Encryption, Formalization of mathematics

## Publications

- Math

1. J. Baek, **S. Lee**, *An equilateral triangle of side $> n$ cannot be covered by $n^2 + 1$ unit equilateral triangles homothetic to it*, accepted to American Mathematical Monthly
2. D. Choi, **S. Lee**, *Non-archimedean Sendov's conjecture*, $p$-adic numbers, Ultrametric Analysis and Applications 14, 77-80 (2022)
3. **S. Lee**, *Maass wave forms, Quantum Modular Forms and Hecke Operators*, Res. Mathematical Science 6, 7 (2018), Modular Forms are Everywhere: Celebration of Don Zagier's 65th Birthday
4. **S. Lee**, *Quantum Modular Forms and Hecke Operators*, Res. Number Theory 4, 18 (2018)
5. 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. **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)
2. **S. Lee**, J. Kim, *Revisiting the Convergence Theorem for Competitive Bidding in Common Value Actions*, Economic Theory Bulletin 10, 293-302 (2022)
3. **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.
4. M. Kim, Y. Shim, **S. Lee**, H. Loh, J. Park, *Behavioral Testing of Deep Knowledge Tracing Models*, Educational Data Mining 2021
5. 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.
6. 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
7. Y. Choi, Y. Lee, D. Shin, J. Cho, S. Park, **S. Lee**, J. Baek, B. Kim, Y. Jang, *EdNet: A Large-Scale Hierarchical Dataset in Education*, International Conference on Artificial Intelligence in Education (2021), 69-73
8. J. Kim, **S. Lee**, *Joint Liability and Stochastic Shapley Value*, International Review of Law & Economics 60 (2019), 1-8

## Awards, Grants & Honours

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.)** Berkeley
UC Berkeley 2019 – Present

- (2023 Fall) Methods of Mathematics: Calculus, Statistics, and Combinatorics
- (2022 Fall) Multivariable Calculus
- (2019 Spring) Methods of Mathematics: Calculus, Statistics, and Combinatorics

**Directed Reading Program** Berkeley
UC Berkeley 2023

- (2023 Fall) Elliptic curves (Jacob Martin)
- (2023 Spring) $p$-adic numbers (Lucas Xie)

**Graduate Student Reader (Grader)** Berkeley
UC Berkeley 2018

- (2018 Fall) Introduction to Abstract Algebra

**Grader & T.A.** Pohang
POSTECH 2015 – 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.)
- (2015 Winter) POSTECH Potential Development Camp for High School Students

**Tutoring** Pohang
POSTECH 2014 – 2015

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

## Talks

- Invited Talks
  - 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
  - Orbit methods and automorphic forms learning seminar, Berkeley, Oct 2022.
    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++, LaTeX, SAGE Math, MATLAB, Haskell, Lean

## Miscelleneous (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)