

Personal

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Research Interests

- **Lattice-based Cryptography**
- **Fully Homomorphic Encryption (FHE)**, including **Threshold FHE**
- **Post-Quantum Cryptography (PQC)**
- **Privacy Enhancing Technologies (PETs)**

Education

- **Ph.D. in Mathematical Sciences—Cryptography**
  - **Institution:** Department of Mathematical Sciences, Seoul National University, Seoul, Korea
  - **Adviser:** Professor Jung Hee Cheon
  - **Period:** Sep. 2019 - Feb. 2025
  - **Thesis Title:** Accelerating Homomorphic Computation through Machine-Efficient Arithmetic
  - **Note:** Integrated MS/PhD, 2 years for MS and 3+ years for PhD.3. GPA: 4.10/4.3 (60 credit hours)
- **B.S. in Mathematical Sciences**
  - **Institution:** Department of Mathematical Sciences, Seoul National University, Seoul, Korea
  - **Period:** March 2013 - Aug. 2019
  - **Grade of Qualification:** Cum Laude. GPA: 3.72/4.3 (146 credit hours)

Awards & Honors

Awards

- **Korean Post-Quantum Cryptography Standardization (KpqC) Competition**, National Security Research Institute (NSR) and National Intelligence Service (NIS). A three-year competition (Sep. 2021 – Jan. 2025) for standardizing Korean PQC Algorithms: KEM/PKE and Digital Signature.
  - **Winner in KEM/PKE:** *SMAUG-T* Key Encapsulation Mechanism, based on C01 and J05.
    - ★ website: <https://www.kpqc.cryptolab.co.kr/smaug-t>.
  - **Winner in Digital Signature:** HAETAE Digital Signature scheme, based on C02.
    - ★ website: <https://www.kpqc.cryptolab.co.kr/haetae>.
- **Korean National Cryptography Contest**, National Security Research Institute (NSR). An annual competition that recognizes outstanding cryptography research papers, aimed at encouraging (under)graduate students and post-doctoral researchers in Korea.
  - **Excellence Award** for C05, Oct. 2025.
  - **Grand Prize** for C03, **Honorable Mention** for M02, and **Special Award** for J05, Oct. 2024.
  - **Honorable Mention** for M01, Oct. 2022.

Cf. Grand Prize: best paper among all tracks; Excellence Award: best paper per track; Other distinctions include Outstanding Award, Honorable Mention, and Special Award.

- **TA Awards**, Seoul National Univ., Dept. of Mathematical Sciences
  - **Excellence in Teaching**: for teaching “Honor Calculus Practice 1 (2023 Spring),” Aug. 2023.
- **2020 iDASH Genomic Data Privacy and Security Protection Competition**, American National Institutes of Health
  - **First Place Prize** in Track I: “Secure Multi-label Tumor Classification using Homomorphic Encryption,” Dec. 2020. The result was later published as J04

## Honors

- **ACM CCS 2024 Doctoral Symposium Travel Grant**, ACM SIGSAC, Oct. 2024.
- **BK 21+ Scholarship**, Ministry of Education of Korea, Sep. 2019 – Feb. 2025.
- **Presidential Science Scholarship** (Undergraduate), Korea Student Aid Foundation, March 2013 – Dec. 2018.

## Experiences

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- **Cryptography Engineer**
  - **Institution**: CryptoLab Inc., Seoul, Korea.
  - **Period**: March 2025 - Present
  - **Topic**: Homomorphic Encryption (HE) and Lattice-based Post-Quantum Cryptography (PQC), focusing on improving HE, implementing practical HE applications, and improving and standardizing KpqC schemes.
- **Research Visit**
  - **Institution**: École Normale Supérieure de Lyon, Lyon, France.
  - **Period**: Sep. - Oct. 2023 (2 months, during PhD studies)
  - **Topic**: Lattice-based cryptography, focusing on new concrete constructions of digital signatures.
- **Sergeant**
  - **Organization**: Intelligence System Management Group, Republic of Korea Air Force (ROKAF)
  - **Period**: July 2015 - July 2017 (2 years, mandatory)

## Public & Professional Services

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### Invited Talks

#### Conference Invited Talks

- **2025 KMS Spring Meeting**, Korean Mathematical Society (KMS), at KAIST, Korea
  - **Title**: HAETAE and SMAUG-T: Korean PQC Standards
  - **Date**: April 25, 2025 (1h)
- **KIAS-JBNU KpqC Workshop**, Korea Institute for Advanced Study (KIAS), at Jeonbuk National Univ., Korea
  - **Title**: HAETAE: Rejecting on Hyperballs
  - **Date**: May 19, 2023 (2h)

#### Seminar Invited Talks

- **Kookmin Univ., Korea**, Dept. of Information Security, Cryptography, and Mathematics
  - **Title**: Security in the Post-Quantum Era: Post-Quantum Cryptography and Standardizations (Translated)
  - **Date**: June 13, 2025 (1h)
- **Ruhr Univ. Bochum, Germany**, Faculty of Computer Science, Security Engineering
  - **Title**: Recent Advances in Fully Homomorphic Encryption
  - **Date**: Jan. 21, 2025 (1.5h), during a week of research visit
- **Sungshin Women's Univ., Korea**, Dept. of Convergence Security Engineering
  - **Title**: HAETAE: Shorter Lattice-based Fiat-Shamir Signatures
  - **Date**: May 21, 2024 (1.5h)
- **2024 KpqC Winter Camp**, KpqC Research Group, at Sogang Univ., Korea
  - **Title**: HAETAE
  - **Date**: Feb. 27, 2024 (1h)

- **2024 Algebra Camp**, QSMS, at Yangpyeong Bloomvista, Korea
  - **Title:** Bridging Algebraic Number Theory to Post-Quantum Digital Signatures
  - **Date:** Feb. 5, 2024 (30m)
- **Korea Univ., Korea**, School of Cybersecurity
  - **Title:** HAETAE, a Post-Quantum Signature Scheme
  - **Date:** July 24, 2023 (2h)
- **2023 KpqC Winter Camp**, KpqC Research Group, at Chung-Ang Univ., Korea
  - **Title:** Introduction to HAETAE
  - **Date:** Feb. 22, 2023 (1h)

### Invited Lectures

- **Sungshin Women's Univ., Korea**, Graduate Course at Dept. of Convergence Security Engineering
  - **Title:** HAETAE: Lattice-based Digital Signature (Translated)
  - **Date:** Sep. 23, 2025 (2h)
- **Cryptography Training for Information Security Professionals**, Korea Cryptography Forum.
  - **Details:** Pre-recorded lectures on lattice-based PQC, as part of a one-week training program.
  - **Date:** Pre-recorded in May, scheduled in June 2025 (3h)
- **Dongguk Univ., Korea**, Undergraduate Course at Dept. of CS & AI
  - **Title:** Security in the Post-Quantum Era: Post-Quantum Cryptography and Standardizations (Translated)
  - **Date:** May 29, 2025 (1.5h)
- **PQC Training Course**, CryptoLab Inc.
  - **Details:** The course was conducted by Dr. Damien Stehlé and Dr. Inkwon Yu. Two half-day lectures on the concrete security of lattice-based PQC were provided in English, as part of a 3-week training course.
  - **Material:** Available at [https://github.com/hmchoe0528/PQC\\_training](https://github.com/hmchoe0528/PQC_training)
  - **Date:** July 16-17, 2024 (7h)
- **2nd 10-10 Gauss Distinguished Lecture Series**, IMDARC, SNU
  - **Details:** A Pre-study of Damien Stehlé's Distinguished Lecture on NIST PQC Standards, focusing on the mathematical foundations of Lattice Crypto (jointly with Prof. Jung Hee Cheon)
  - **Date:** Sep. 15, 2023 (30m)

### Journal & Conference Reviewing

- **Program Committee Member:** ICISC 2025, ACM CCS 2026.
- **Journals:** Design, Codes and Cryptography (DCC), Journal of Cryptology (JoC).
- **Conferences:** Sub/External reviewer for ANTS 2020, MathCrypt 2021, PQCrypto 2021, Asiacrypt 2021, 2022, ACM CCS 2022, FHE.org 2022, PQCrypto 2023, PKC 2024, Eurocrypt 2024, PQCrypto 2024, Asiacrypt 2025.

## Publications

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Authors are listed alphabetically by last name (see AMS 2004 statement), unless marked with an asterisk (\*). A dagger (†) indicates the corresponding author, when applicable.

### Conferences (refereed)

- C06 Hyeongmin Choe, Jaehyung Kim, Damien Stehlé, Elias Suvanto, "Leveraging Discrete CKKS to Bootstrap in High Precision." Accepted to **ACM CCS 2025** (ACM Conference on Computer and Communications Security).
- C05 Jung Hee Cheon, Hyeongmin Choe, Minsik Kang, Jaehyung Kim, Seonghak Kim, Johannes Mono, Taeyeon Noh "Grafting: Decoupled Scale Factors and Modulus in RNS-CKKS," Accepted to **ACM CCS 2025** (ACM Conference on Computer and Communications Security).
- C04 Hyeongmin Choe<sup>†</sup>, "Toward Practical Threshold FHE: Low Communication, Computation and Interaction," **ACM CCS 2024 Doctoral Symposium**. 3-Page Extended Abstract.

- C03 Jung Hee Cheon, Hyeongmin Choe<sup>†</sup>, Alain Passelègue, Damien Stehlé, and Elias Suvanto, “Attacks Against the IND-CPA<sup>D</sup> Security of Exact FHE Schemes,” **ACM CCS 2024** (*ACM Conference on Computer and Communications Security*).
- C02 Jung Hee Cheon, Hyeongmin Choe, Julien Devevey, Tim Güneysu, Dongyeon Hong, Markus Krausz, Georg Land, Marc Möller, Damien Stehlé, and MinJune Yi, “HAETAE: Shorter Lattice-Based Fiat-Shamir Signatures,” **CHES 2024** (*Conference on Cryptographic Hardware and Embedded Systems*).
- C01 Jung Hee Cheon, Hyeongmin Choe<sup>†</sup>, Dongyeon Hong, and MinJune Yi, “SMAUG: Pushing Lattice-based Key Encapsulation Mechanisms to the Limits,” **SAC 2023** (*Selected Areas in Cryptography*).

## Journals (refereed)

- J06 Jung Hee Cheon, Hyeongmin Choe, and Jai Hyun Park, “Tree-based Lookup Table on Batched Encrypted Queries using Homomorphic Encryption,” **JKMS** (*Journal of the Korean Mathematical Society*), vol. 62, pp. 1237–1263, Sep. 2025.
- J05 Jung Hee Cheon, Hyeongmin Choe<sup>†</sup>, Jungjoo Seo, Hyoeun Seong, “SMAUG(-T), Revisited: Timing-secure, More Compact, Less Failure,” **IEEE ACCESS**, vol. 12, pp. 188386–188397, Dec. 2024.
- \*J04 Seungwan Hong, Jai Hyun Park, Wonhee Cho, Hyeongmin Choe and Jung Hee Cheon<sup>†</sup>, “Secure tumor classification by shallow neural network using homomorphic encryption,” **BMC Genomics**, vol. 23, no. 284, April 2022.
- J03 Jung Hee Cheon, Hyeongmin Choe, Donghwan Lee and Yongha Son<sup>†</sup>, “Faster Linear Transformations in **HElib**, revisited,” **IEEE Access**, vol. 7, pp. 50595–50604, April 2019.
- \*J02 Siyul Lee and Hyeongmin Choe, “On Fourth-order Iterative Methods for Multiple Roots of Nonlinear Equations with High Efficiency,” **JoCAAA** (*Journal of Computational Analysis and Applications*), vol. 18, no. 1, pp. 109–120, Jan. 2015.
- \*J01 Siyul Lee and Hyeongmin Choe, “Multiplicational Combinations and A General Scheme of Single-step Iterative Methods for Multiple Roots,” **JoCAAA** (*Journal of Computational Analysis and Applications*), vol. 15, no. 6, pp. 1138–1149, Oct. 2013.

## Technical Articles & Specifications (non-refereed)

- T04 Hyeongmin Choe, Jeongdae Hong, “Korean Post-Quantum Cryptography Algorithm HAETAE: Lattice-based Digital Signature Scheme,” Invited Article, **Review of KIISC** (*Korea Institute of Information Security and Cryptology*), vol. 35, no. 3, pp. 15–20, June 2026.  
★ Title translated. Original title is “한국형 양자내성암호 HAETAE: 격자기반 전자서명 스킴.”
- T03 Hyeongmin Choe, Jeongdae Hong, “Korean Post-Quantum Cryptography Algorithm SMAUG-T: Lattice-based Key Encapsulation Mechanism,” Invited Article, **Review of KIISC** (*Korea Institute of Information Security and Cryptology*), vol. 35, no. 3, pp. 21–27, June 2026.  
★ Title translated. Original title is “한국형 양자내성암호 SMAUG-T: 격자기반 키 캡슐화 메커니즘 스킴.”
- T02 Jung Hee Cheon, Hyeongmin Choe, Julien Devevey, Tim Güneysu, Dongyeon Hong, Markus Krausz, Georg Land, Marc Möller, Junbum Shin, Damien Stehlé and MinJune Yi, “HAETAE: Hyperball bimodAl modulE rejecTion signAture schemE,” Algorithm Specification v0.9 - v3.0, for **KpqC Competition** and **NIST Additional Signatures**.
- T01 Jung Hee Cheon, Hyeongmin Choe, Joongeun Choi, Dongyeon Hong, Jeongdae Hong, Chi-Gon Jung, Honggoo Kang, Janghyun Lee, Seonghyuck Lim, Aesun Park, Seunghwan Park<sup>3</sup>, Jungjoo Seo, Hyoeun Seong, and Junbum Shin, “SMAUG(-T): the Key Exchange Algorithm based on Module-LWE and Module-LWR,” Algorithm Specification v0.9 - v4.0, for **KpqC Competition**.

## Manuscripts (non-refereed)

Manuscripts that are archived or near completion.

- M02 Jung Hee Cheon, Hyeongmin Choe, Yongdong Yeo, “Reusable Dynamic Multi-Party Homomorphic Encryption.” *Cryptology ePrint Archive, Paper 2025/581*, April 2025.
- M01 Jung Hee Cheon, Hyeongmin Choe, Saebyul Jung, Duhyeong Kim, Dah Hoon Lee, and Jai Hyun Park, “Arithmetic PCA for Encrypted Data,” *Cryptology ePrint Archive, Paper 2023/1544*, Oct. 2023.

## Teaching Record

- **Calculus TA Seminar**, Dept. of Mathematical Sciences, SNU, 2024 Spring
  - **Role:** TA. Guided new TAs on teaching skills and student management strategies.

- **Calculus Practice Sessions**, College of Natural Sciences, SNU, 2020 - 2023 (7 semesters)
  - **Role:** TA and Lecturer. Delivered 2-hour weekly practice sessions with summarized content and guided students.
  - **Teaching Evaluation (Student Survey):** Avg. 94.6 / 100. Awarded “*Excellence in Teaching*” in 2023 Spring.
- **(i-TAP) Post-Quantum Cryptography**, SK Hynix Inc., April - May (5 weeks), 2021
  - **Role:** TA and Co-lecturer for i-TAP (Innovative Technology Advancement Program). Delivered 8 of 26 total hours as a co-lecturer. Also contributed to course material development and led Q&A and discussion sessions on lattice-based PQC.
- **Korean Mathematical Olympiad (KMO) Winter/Summer Schools**, Korean Mathematical Society, 2013-2014
  - **Period:** Jan. & Aug., 2013, and Jan. & Aug., 2014 (each 2-3 weeks)
  - **Role:** Residential TA. Managed and supported gifted students during intensive camps. Led problem-solving exercises and evaluations.

## Patents

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The list includes (filed or granted) patents that are publicly disclosed.

- Jung Hee Cheon and Hyeongmin Choe, “Apparatus for conversion of homomorphic encrypted message and method thereof,”
  - Korea Patent No. KR102782557, Granted, Feb. 2025.
- Jung Hee Cheon and Hyeongmin Choe, “Apparatus for generating blind signature and method thereof,”
  - US Patent No. US12309293, Granted, May 2025.
  - Applications No. KR20230127905A, Pending.
- Jung Hee Cheon, Hyeongmin Choe, and Dongyeon Hong, “Electronic device for encrypting data by public key and methods thereof,”
  - Applications No. KR20240081407A and US20240178992A, Pending.
- Jung Hee Cheon, Hyeongmin Choe, and Jai Hyun Park, “Electronic device for searching encrypted data and methods thereof,”
  - US Patent No. US12367404, Granted, July 2025.
  - Applications No. KR20240118024A, Pending.
- Jung Hee Cheon, Hyeongmin Choe, and Jai Hyun Park, “Electronic device for making decision and methods thereof,”
  - Applications No. KR20240118025A and US20240289650A1, Pending.
- Jung Hee Cheon, Hyeongmin Choe, Minsik Kang, and Jaehyung Kim, “Electronic apparatus for performing operations on homomorphic ciphertext and control method thereof,”
  - Applications No. KR20250018059A, US20250266984A1, and EP4607842A1, Pending.

## Contributed Talks

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### Conferences and Workshops

- **ACM CCS 2024 Doctoral Symposium**, at Salt Lake City, US
  - **Title:** Toward Practical Threshold FHE: Low Communication, Computation and Interaction
  - **Date:** Oct. 14, 2024
- **Selected Areas in Cryptography (SAC) 2023**, at Univ. of New Brunswick, Canada
  - **Title:** SMAUG: Pushing Lattice-based Key Encapsulation Mechanisms to the Limits
  - **Date:** Aug. 16, 2023

### Research Camps and Colloquiums

- **KpqC Contest 2nd Round Colloquium**, KpqC Research Group, at Hansung Univ., Korea
  - **Title:** HAETAE v3.0
  - **Date:** Aug. 28, 2024 (20m)
- **2024 KMS Spring Meeting**, Korean Mathematical Society (KMS), at Daejeon Convention Center, Korea
  - **Title:** IND-CPA<sup>D</sup> and KR<sup>D</sup> Security of Exact (F)HEs
  - **Date:** April 19, 2024 (20m)

- **2024 Crypto Winter Camp**, SNU Cryptography Lab, at Vivaldi Park, Korea
  - **Title:** IND-CPA<sup>D</sup> and KR<sup>D</sup> security of FHE and application to Threshold-FHE
  - **Date:** Jan. 4, 2024 (1h)
- **2023 Crypto Winter Camp**, SNU Cryptography Lab, at Konjiam Resort, Korea
  - **Title:** Introduction to SMAUG KEM and HAETAE signature schemes
  - **Date:** Jan. 5, 2023 (1h)
- **2022 KMS Spring Meeting**, Korean Mathematical Society (KMS), Virtual
  - **Title:** Efficient, round-optimal blind signatures from standard assumptions
  - **Date:** April 28, 2022 (20m)
- **2020 KMS Annual Meeting**, Korean Mathematical Society (KMS), Virtual
  - **Title:** Conversion between two RLWE-based FHE schemes and its application
  - **Date:** Oct. 24, 2020 (20m)