

DUHYEONG KIM

Curriculum Vitae

CONTACT INFORMATION

Affiliation	Department of Mathematical Sciences, Seoul National University
Address	1, Gwanak-ro, Gwanak-gu, Seoul, Republic of Korea, 08826
Office Number	+82-2-880-6272
Website	https://du1204.github.io
E-mail	doodoo1204@snu.ac.kr
Birth	4th December, 1993

EDUCATION

Seoul National University, Republic of Korea

Integrated M.S./Ph.D. in Mathematical Sciences	Mar 2015 ~ Present
Advisor: Prof. Jung Hee Cheon	

B.S. in Mathematical Sciences	Mar 2011 ~ Feb 2015
Honors: <i>Summa Cum Laude</i> (Major GPA: 4.13/4.3)	

Gyeonggi Science High School, Republic of Korea

High School Diploma	Mar 2009 ~ Feb 2011
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RESEARCH INTERESTS

- **Homomorphic Encryption (HE)**
 - Construction of New HE Schemes
 - Algorithms for Homomorphic Non-Arithmetic Operations
 - Privacy-Preserving Machine Learning
- **Lattice-based Cryptography**
 - Post-Quantum Public-Key Encryption
 - Construction of Lattice Trapdoor
 - Reduction/Analysis on Lattice-based Hard Problems

WORK EXPERIENCES

UTHealth	Aug 2018
Visiting Researcher (Hosted by Prof. Xiaoqian Jiang)	<i>Houston, TX, United States</i>
ENS de Lyon	Dec 2017 ~ Jan 2018
Visiting Researcher (Hosted by Prof. Damien Stehlé)	<i>Lyon, France</i>

PUBLICATIONS

Authors are listed in alphabetical order by last name, unless an asterisk (*) is indicated.

Conference

6. Jung Hee Cheon, Dongwoo Kim and **Duhyeong Kim**. “Efficient Homomorphic Comparison Methods with Optimal Complexity”. To Appear at ASIACRYPT 2020.
 - *Gold Award at 26th Samsung Humantech Paper Award (1st place in Computer Science & Engineering)*
5. Jung Hee Cheon, Kyoohyung Han and **Duhyeong Kim**. “Faster bootstrapping of FHE over the integers.” In International Conference on Information Security and Cryptology (ICISC), pp. 242-259. Springer, Cham, 2019.
4. Jung Hee Cheon, Dongwoo Kim, **Duhyeong Kim**, Hun Hee Lee and Keewoo Lee. “Numerical Methods for Comparison on Homomorphically Encrypted Numbers.” In International Conference on the Theory and Application of Cryptology and Information Security (ASIACRYPT), pp. 415-445. Springer, Cham, 2019.
 - *Invited to Journal of Cryptology (Top 3 of 71 accepted papers among 307 submissions)*
 - *Excellence Award at 5th Samsung DS Industry-Academy Cooperation Project Paper Award*
3. Jung Hee Cheon, **Duhyeong Kim**, and Jai Hyun Park. “Towards a practical cluster analysis over encrypted data.” In International Conference on Selected Areas in Cryptography (SAC), pp. 227-249. Springer, Cham, 2019.
2. **Duhyeong Kim**, and Yongsoo Song. “Approximate Homomorphic Encryption over the Conjugate-Invariant Ring.” In International Conference on Information Security and Cryptology (ICISC), pp. 85-102. Springer, Cham, 2018.
1. Jung Hee Cheon, **Duhyeong Kim**, Joohee Lee, and Yongsoo Song. “Lizard: Cut off the tail! A practical post-quantum public-key encryption from LWE and LWR.” In International Conference on Security and Cryptography for Networks (SCN), pp. 160-177. Springer, Cham, 2018.

Journal

4. ***Duhyeong Kim**, Yongha Son, Dongwoo Kim, Andrey Kim, Seungwan Hong and Jung Hee Cheon. “Privacy-preserving Approximate GWAS computation based on Homomorphic Encryption.” BMC Medical Genomics 13, 77 (2020).
3. *Joohee Lee, **Duhyeong Kim**, Hyungkyu Lee, Younho Lee, and Jung Hee Cheon. “RLizard: Post-Quantum Key Encapsulation Mechanism for IoT Devices.” IEEE Access 7 (2019): 2080-2091.
2. Jung Hee Cheon, **Duhyeong Kim**, Yongdai Kim, and Yongsoo Song. “Ensemble method for privacy-preserving logistic regression based on homomorphic encryption.” IEEE Access 6 (2018): 46938-46948.
1. Jung Hee Cheon, and **Duhyeong Kim**. “Probability that the k-gcd of products of positive integers is B-friable.” Journal of Number Theory 168 (2016): 72-80.

MANUSCRIPTS

4. *Miran Kim, *Arif Harmanici, Jean-Philippe Bossuat, Sergiu Carpov, Jung Hee Cheon, Ilaria Chillotti, Wonhee Cho, David Froelicher, Nicolas Gama, Mariya Georgieva, Seungwan Hong, Jean-Pierre Hubaux, **Duhyeong Kim**, Kristin Lauter, Yiping Ma, Lucila Ohno-Machado, Heidi Sofia, Yongha Son, Yongsoo Song, Juan Troncoso-Pastoriza and Xiaoqian Jiang. “Ultra-Fast Homomorphic Encryption Models enable Secure Outsourcing of Genotype Imputation. Available at <https://www.biorxiv.org/content/10.1101/2020.07.02.183459v1>.

3. Jung Hee Cheon, **Duhyeong Kim**, Taechan Kim and Yongha Son. “A New Trapdoor over Module-NTRU Lattice and its Application to ID-based Encryption”. Available at <https://eprint.iacr.org/2019/1468.pdf>.
2. *Yongsoo Song, Jacek Cyranka, **Duhyeong Kim** and Sicun Gao. “Convergence and Oscillation of Low-Precision Stochastic Gradient Descent”.
1. Jung Hee Cheon, Dongwoo Kim, **Duhyeong Kim**, Joohee Lee and Yongsoo Song. “Instant Privacy-Preserving Biometric Authentication for Hamming Distance Matcher”. Available at <https://eprint.iacr.org/2018/1214.pdf>.

TALKS

Complexity-Optimal Homomorphic Comparison

East Asian Core Doctoral Forum on Mathematics 2020 in Tokyo, Japan	Jan 2020
Winter Crypto Camp 2020 in Konjiam Resort, Republic of Korea	Jan 2020
Crypto Lab in Seoul, Republic of Korea	Dec 2019

Numerical Methods for Homomorphic Comparison

Asiacrypt 2019 in Kobe, Japan	Dec 2019
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A New Trapdoor over Module-NTRU Lattices and its Applications

Winter Crypto Camp 2019 in Konjiam Resort, Republic of Korea	Jan 2019
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Approximate HE over the Conjugate-Invariant Ring (a.k.a. Real-HEAAN)

ICISC 2018 in Seoul, Republic of Korea	Nov 2018
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Lizard: A New Practical Post-Quantum PKE from LWE and LWR

SCN 2018 in Amalfi, Italy	Sep 2018
2017 KMS Annual Meeting in Dankook University, Republic of Korea	Oct 2017

PATENTS

5. Jung Hee Cheon, **Duhyeong Kim** and Yongha Son. ID-based Encryption over Generalized NTRU Trapdoor Lattice. *KR1020190155732*, filed November 28, 2019.
4. Jung Hee Cheon, **Duhyeong Kim** and Dongwoo Kim. Apparatus for Processing Non-Polynomial Operation on Encrypted Messages and Methods Thereof. *KR1020190128403*, filed October 16, 2019.
3. Jung Hee Cheon, **Duhyeong Kim**, Yongsoo Song and Kyoohyung Han. Terminal Device Performing Homomorphic Encryption, Server Device Processing Ciphertext and Methods Thereof. *US16478596*, filed December 7, 2018.
2. Jung Hee Cheon, **Duhyeong Kim** and Yongsoo Song. Method for Homomorphic Encryption of Plain Text in Real Numbers. *KR1020180129749*, filed October 29, 2018, and issued October 29, 2019.
1. Joohee Lee, Jung Hee Cheon, **Duhyeong Kim** and Aaram Yun. Method for Key Generation, Encryption, and Decryption for Public Key Encryption Scheme Based on Module-Wavy and Module-LWR. *KR1020170183661*, filed December 29, 2017, and issued September 25, 2019.

AWARDS

5th Samsung DS Industry-Academy Cooperation Project Paper Award Excellence Award (\$2,500)	Jul 2020 <i>Samsung Electronics</i>
26th Samsung Humantech Paper Award Gold Award (\$10,000); 1 st place in CSE	Feb 2020 <i>Samsung Electronics</i>

Runner-up: Asiacrypt 2019 Invited to Journal of Cryptology	Dec 2019 <i>International Association for Cryptologic Research</i>
Korea Cryptography Contest Excellence Award (\$1,500)	Nov 2019 <i>Korea Institute of Information Security and Cryptology</i>
iDASH 2019 One of the Winners of Track 2	Oct 2019 <i>National Institutes of Health (NIH)</i>
Global Empowerment Program for top 10% of Global PhD Fellowship Research Grant: \$5,000	May 2018 <i>National Research Foundation of Korea</i>
Global PhD Fellowship Research Grant: Tuition+\$20,000/year for 5 years	Mar 2016 ~ Present <i>National Research Foundation of Korea</i>
Awards for Excellence in Teaching For teaching Differential and Integral Calculus	Mar 2016 <i>Seoul National University</i>
The Presidential Science Scholarship Academic Grant: Tuition+\$5,000/year for 4 years	Mar 2011 ~ Feb 2015 <i>Korea Student Aid Foundation</i>
University Students Contest of Mathematics Silver Prize (Top 40)	Nov 2012 <i>Korean Mathematical Society</i>
Korean Mathematical Olympiad Gold Prize (Top 40)	Nov 2009 <i>Korean Mathematical Society</i>

SERVICES

Reviewer / External Reviewer

- Designs, Codes and Cryptography (DCC), Journal of Cryptology (JoC), IEEE Transactions on Computers (TC), Journal of Biomedical and Health Informatics (JBHI)
- CRYPTO 2017; ASIACRYPT 2019; PKC 2020, 2019; CT-RSA 2019; ANTS 2020; FC 2017; PQCrypto 2020, 2019, 2018

TEACHING EXPERIENCE

Introduction to Cryptography	Mar 2017 ~ Jun 2017
Differential and Integral Calculus	Mar 2015 ~ Dec 2017
Linear Algebra	Mar 2015 ~ Dec 2017

GITHUB REPOSITORIES

https://github.com/idadashSNU/Imputation/tree/master/ModHEaaN	Light Version of HEAAN
https://github.com/idadashSNU/Imputation	HE-based Genotype Imputation
https://github.com/LizardOpenSource/Lizard_c	Reference Implementation of Lizard
https://github.com/du1204/EnsembleLR	HE-based Ensemble Logistic Regression
https://github.com/du1204/iDASH2018	HE-based Semi-Parallel GWAS

LANGUAGES AND SKILLS

Languages	Korean (native), English (fluent)
Skills	C/C++, Python, \LaTeX

REFERENCES

Jung Hee Cheon	Professor at Seoul National University	<code>jhcheon@snu.ac.kr</code>
Damien Stehlé	Professor at ENS de Lyon	<code>damien.stehle@ens-lyon.fr</code>
Xiaoqian Jiang	Associate Professor at UTHHealth	<code>Xiaoqian.Jiang@uth.tmc.edu</code>