

# DUHYEONG KIM

*Curriculum Vitae*

## CONTACT INFORMATION

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<b>Affiliation</b>	Department of Mathematical Sciences, Seoul National University
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## EDUCATION

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### 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
Honers: <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

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- **Homomorphic Encryption**

- Construction of New Homomorphic Encryption 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

## VISITING RESEARCH

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<b>UTHealth</b>	Aug 2018
Hosted by Prof. Xiaoqian Jiang	<i>Houston, TX, United States</i>

<b>ENS de Lyon</b>	Dec 2017 ~ Jan 2018
Hosted by Prof. Damien Stehlé	<i>Lyon, France</i>

## PUBLICATIONS

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

### Conference

5. Jung Hee Cheon, Kyoohyung Han and **Duhyeong Kim**. “Faster bootstrapping of FHE over the integers.” To appear in ICISC 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.
  - Award: *Invited to Journal of Cryptology (Top 3 of 71 accepted papers among 307 submissions)*
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." To Appear in BMC Medical Genomics.
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

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4. 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>.
3. Jung Hee Cheon, Dongwoo Kim and **Duhyeong Kim**. "Efficient Homomorphic Comparison Methods with Optimal Complexity". Available at <https://eprint.iacr.org/2019/1234.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

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### 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

## Approximate HE over the Conjugate-Invariant Ring (a.k.a. Real-HEAAN)

ICISC 2018 in Seoul, Republic of Korea

Nov 2018

## 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

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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.

## SERVICES

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### Reviewer / External Reviewer

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

## TEACHING EXPERIENCE

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Introduction to Cryptography

Mar 2017 ~ Jun 2017

Differential and Integral Calculus

Mar 2015 ~ Dec 2017

Linear Algebra

Mar 2015 ~ Dec 2017

## AWARDS

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### 26<sup>th</sup> Samsung Humantech Paper Award

Feb 2020

Gold Award (\$10,000); 1st place in CSE

*Samsung Electronics*

### Runner-up: Asiacrypt 2019

Dec 2019

Invited to Journal of Cryptology

*International Association for Cryptologic Research*

### Korea Cryptography Contest

Nov 2019

Excellence Award (\$1,500)

*Korea Institute of Information Security and Cryptology*

<b>iDASH 2019</b>	Oct 2019
One of the Winners of Track 2	<i>National Institutes of Health (NIH)</i>
<b>Global Empowerment Program for top 10% of Global PhD Fellowship</b>	May 2018
Research Grant: \$5,000	<i>National Foundation Research of Korea</i>
<b>Global PhD Fellowship</b>	Mar 2016 ~ Present
Research Grant: Tuition+\$20,000/year for 5 years	<i>National Foundation Research of Korea</i>
<b>Awards for Excellence in Teaching</b>	Mar 2016
For teaching Differential and Integral Calculus	<i>Seoul National University</i>
<b>The Presidential Science Scholarship</b>	Mar 2011 ~ Feb 2015
Academic Grant: Tuition+\$5,000/year for 4 years	<i>Korea Student Aid Foundation</i>
<b>Korean Mathematical Olympiad</b>	Nov 2009
Gold Prize (Top 40)	<i>Korean Mathematical Society</i>

## LANGUAGES AND SKILLS

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<b>Languages</b>	Korean (native), English (fluent)
<b>Skills</b>	C/C++, Python, $\text{\LaTeX}$