

## Junhao Huang

PhD Student

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### Education

- **BNU-HKBU United International College**  
*PhD student at Data Science and Technology*  
Supervisor: Dr. Donglong Chen  
Sep. 2021-now
- **Nanjing University of Aeronautics and Astronautics**  
*Master Degree of Cyberspace Security*  
Supervisor: Prof. Zhe Liu  
Sep. 2018-Jun. 2021
- **Nanjing University of Aeronautics and Astronautics**  
*Bachelor Degree of Computer Science and Technology*  
GPA: 3.7  
Sep. 2014-Jun. 2018

### Research Interest

- Cryptographic Engineering, Public-key Cryptography, Lattice-based Cryptography.

### Research Activities

- **IACR CHES/TCHES 2024 Artifact Evaluation Committee**  
*International Association for Cryptologic Research (IACR)*  
Halifax, Canada  
Oct. 2023-Oct. 2024
- **Visiting Scholar, Electrical Engineering**  
*City University of Hong Kong, Prof. Ray C. C. Cheung*  
Hong Kong, China  
Jul. 2023-Dec. 2023
- **Visiting Scholar, Cyberspace Security**  
*Wuhan University, Prof. Debiao He*  
Whuhan, China  
Sep. 2019-Jan. 2020

### Publications

#### - Journal Publications

1. Revisiting Keccak and Dilithium Implementations on ARMv7-M,  
**Junhao Huang**, Alexandre Adomnicăi, Jipeng Zhang, Wangchen Dai, Yao Liu, Ray C. C. Cheung, Çetin Kaya Koç, Donglong Chen\*.  
In [IACR Transactions on Cryptographic Hardware and Embedded Systems, Volume 2024, Issue 2. \(CCF-B\)](#)
2. Yet another Improvement of Plantard Arithmetic for Faster Kyber on Low-end 32-bit IoT Devices,  
**Junhao Huang**, Haosong Zhao, Jipeng Zhang, Wangchen Dai, Lu Zhou, Çetin Kaya Koç, Ray C.C. Cheung, Donglong Chen\*.  
In <https://arxiv.org/abs/2309.00440>

3. Improved Plantard Arithmetic for Lattice-based Cryptography,  
**Junhao Huang**, Jipeng Zhang, Haosong Zhao, Zhe Liu, Ray C. C. Cheung, Çetin Kaya Koç, Donglong Chen\*.  
In [IACR Transactions on Cryptographic Hardware and Embedded Systems, Volume 2022, Issue 4. \(CCF-B\)](#)
4. Time-memory Trade-offs for Saber on Memory-constrained RISC-V,  
Jipeng Zhang, **Junhao Huang**, Zhe Liu\*, Sujoy Sinha Roy.  
In [IEEE Transactions on Computers, 2022 \(CCF-A\)](#)
5. High-Speed AVX2 Implementation of AKCN-MLWE,  
YANG Hao, LIU Zhe\*, **HUANG Jun-Hao**, SHEN Shi-Yu ZHAO Yun-Lei.  
In [Chinese Journal of Computers, 2021](#)

#### - Conference Publications

1. Efficient Implementation of Kyber on Mobile Devices,  
Lirui Zhao, Jipeng Zhang, **Junhao Huang**, Zhe Liu\*, Gerhard Hancke,  
In [IEEE International Conference on Parallel and Distributed Systems - ICPADS 2021 \(CCF-C\)](#)
2. Parallel Implementation of SM2 Elliptic Curve on Intel Processor with AVX2.  
**Junhao Huang**, Zhe Liu\*, Zhi Hu, and Johann Großschädl.  
In [Australasian Conference on Information Security and Privacy - ACISP 2020 \(CCF-C\)](#)
3. An Efficient and Scalable Sparse Polynomial Multiplication Accelerator for LAC on FPGA,  
Jipeng Zhang, Zhe Liu\*, Hao Yang, **Junhao Huang**, Weibin Wu.  
In [IEEE International Conference on Parallel and Distributed Systems - ICPADS 2020 \(CCF-C\)](#)

### Reaserch Experiences

- Jul. 2023- Oct. 2023, Revisiting Keccak and Dilithium Implementations on ARMv7-M
  - Further improve Keccak's performance using lazy rotation and better memory access scheduling on ARMv7-M.
  - Efficient multi-moduli NTT with Plantard arithmetic for the small polynomial multiplication in Dilithium on ARM Cortex-M3.
  - Obtain large speed-ups for Keccak and Dilithium on Cortex-M3 and Cortex-M4.
- Sep. 2022- Mar. 2023, Yet another Improvement of Plantard Arithmetic for Faster Kyber on Low-end 32-bit IoT Devices
  - Further extend the input range of the improved Plantard arithmetic tailored for Kyber.
  - Efficient NTT/INTT implementation on Cortex-M3 and RISC-V.
  - Speed-ups for Kyber on Cortex-M3 and RISC-V.
- Sep. 2021- Apr. 2022, Improved Plantard Arithmetic for Lattice-based Cryptography
  - Present an improved Plantard arithmetic tailored for LBC.
  - Obtained speed-ups for Kyber and NTTRU with 16-bit NTT on Cortex-M4.
  - The source code has been merged into pqm4, PR#244 (merged at 25th, Oct, 2022).
- Dec. 2020- Apr. 2021, Memory Efficient Implementation of Saber on RISC-V
  - Reduce the memory usage of Saber by using a **just-in-time** public matrix, secret, and noise generation technique.

- Represent the secret, and noise with a new **smaller data-type**, which reduces the size of the secret and noise.
- Apr. 2019- Nov. 2020, Accelerating ECC utilizing the Double Precision Floating-point Number on GPU
  - Implement the prime field arithmetic for the prime modulus  $p = 2^n - \delta$  by combining the computing power of **the fused multiply-add instruction of double-precision floating-point number** and the addition, subtraction, and shift instructions of integer number.
  - Propose how to perform multi-precision multiplication over unreduced-form big number, which optimizes the point multiplication, especially Montgomery ladder algorithm for Montgomery curves, with the **lazy reduction technique**.
- Apr. 2019- Oct. 2019, Parallel Implementation of SM2 Elliptic Curve with AVX2
  - Utilize SIMD AVX2 instruction set to implement 2-way SM2 prime field operations.
  - Reschedule the (X,Y)-only Co-Z Jacobian arithmetic and perform the symmetric operations using the 2-way prime field operations
  - Implement the Co-Z based Montgomery ladder algorithm based on the parallel Co-Z Jacobian arithmetic.
  - The number of the 2-way prime field operations of the Co-Z Jacobian arithmetic is reduced to a half compared to the sequential implementation.
  - The AVX2 version Co-Z based Montgomery ladder algorithm is **1.31** times faster than the X64 assembly implementation.

## Honor Certificates

- May. 2023 Third prize for the Guangdong Province Cyberspace Security Outstanding Paper Award, GDCA.
- Apr. 2023 Best RPG Poster Award of Faculty of Science & Technology, BNU-HKBU UIC.
- Nov. 2019 Patent for An efficient implementation of Co-Z based Montgomery ladder algorithm using AVX2, CN112367172A.
- Oct. 2018 Postgraduate **First prize** Scholarship
- Oct. 2018 **First Prize** of Academic Scholarship
- Jun. 2018 Software Copyright for the University Association Information Management System
- Oct. 2017 National Encouragement Scholarship, **Third Prize** of Outstanding Student Scholarship
- Oct. 2016 National Encouragement Scholarship, **Second Prize** of Outstanding Student Scholarship
- Oct. 2015 National Encouragement Scholarship, **First Prize** of Outstanding Student Scholarship

## Professional Skills

1. Language Level: CET-4: 597, CET-6: 513, IELTS: 7.0
2. Programming Language: C/C++, x86-64/Cortex-M4/Cortex-M3/RISC-V Assembly, AVX2 and CUDA programming, Python