Changxu Liu

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Education

Wuhan University *HUB, CN*

B.E. in Microelectronics Science and Engineering *Sept. 2018-Jun. 2022*

- Thesis: Research on Fully Homomorphic Encryption Acceleration Methods
- Graduated with Distinction
- GPA: 3.86/4.00

Fudan University *SH, CN*

Ph.D student in Electronic Science and Technology *Sept. 2022-Jun. 2027 (expected)*

- Supervisor: Prof. Fan Yang.
- Research Interest: Privacy-Preserving Computation Applications; Efficient Hardware Accelerator Design; Software-Hardware Co-design

Project Experience

Design of Embedded Systems Based on AI Hardware Accelerator *Wuhan University*

Key Project Contributor *Jun. 2020-Sept. 2021*

- Accelerating computationally intensive AI algorithms. Using Vivado HLS technology to design a highly parallel convolutional IP.
- Building an embedded system with convolutional IP design for testing in traditional Chinese medicine recognition scenarios.
- Won third place in DIGILENT cup in CICC 2021.

SoC Design for Zero-Knowledge Proofs *Fudan University*

Key Project Contributor *Apr. 2022-Now*

- Responsibility lies in the design of the hard accelerator for the proof generation phase of zero-knowledge proof within the SoC.
- Designing key IPs, including MSM unit and various polynomial processing units
- The MSM accelerator is implemented using the bucket method algorithm, and optimization techniques are applied specifically for parallel computation with multiple PEs. resulting in remarkably high throughput.
- One paper with the first author has been accepted by DAC'24 (CCF-A). One paper with the first author is currently being revised.

Intern Experience

Zhcltech Technology Co., Ltd *SH, CN*

Hardware Engineer Intern *Oct. 2021-Apr. 2022*

- Designed a small SoC with a low-power arm core, mainly responsible for hardware accelerator startup, parameter loading, register configuration, interacting with the host for operation information, correcting runtime errors, and resetting the entire accelerator.
- Responsible for the design of CSR (Control/Status Register) Ring for the whole accelerator, which is used to control parameters related to the accelerator behavior and monitor the overall state of the accelerator.

Ant Research, Ant Group *SH, CN*

Research Intern *Aug. 2023-Now*

- Researching the foundational algorithms for privacy-preserving computation, with a primary focus on Fully Homomorphic Encryption algorithms, particularly those based on the CKKS scheme.
- Investigating circuit optimizations for the pipeline-based Number Theoretic Transform and optimizing the design of MDC-type NTT from a hardware architecture perspective.
- One paper has been submitted to ACM GLSVLSI '24 (CCF-C) for review.

Publications

Conference Proceedings

Gypsophila: A Scalable and Bandwidth-Optimized Multi-Scalar Multiplication Architecture
Changxu Liu, Hao Zhou, Lan Yang, Jiamin Xu, Patrick Dai, Fan Yang
2024 61st ACM/IEEE Design Automation Conference (DAC), 2024

Achievements

2021	**Meritorious Winner**, Mathematical Contest In Modeling(MCM)	*America*
2020	**Second Prize**, National Mathematics Competition for College Students	*China*
2020	**National Excellence Award**, "ABB" Technology Innovation Competition	*China*
2019	**Merit Student**, Wuhan University	*China*
2019	**First-class Scholarship**, Wuhan University	*China*
2019	**First-class Academic Scholarship**, HONGYI Honor College School, Wuhan University	*China*

Skills

English Proficiency	IELTS: 7.5 Listening: 8.5 Reading: 8 Writing: 6.5 Speaking: 6
Programming	Verilog HDL, Python (OpenCV, NumPy, Tensorflow. etc.), C++, Scala, MATLAB, LaTeX
Soft Skills	Vivado, VCS, Verdi, Design Compiler, Quartus, Spyglass
Miscellaneous	Linux, Git