# Yilong Zhao

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#### **EDUCATION**

2022.9 – Now	Shanghai Jiao Tong University (SJTU), Shanghai, China		
	Ph.D Student	, Major: Computer Science and Technology	
2018.9 - 2021.3	Shanghai Jiao Tong University (SJTU), Shanghai, China		
	M.Eng.	, Major: Computer Technology	GPA: 3.49/4.0
2014.9 - 2018.6	Shanghai Jiao Tong University (SJTU), Shanghai, China		
	B.Eng.	Major: Electronic Science and Technology	GPA: 3.51/4.3
	-	Minor: Business Administration	

#### PUBLICATIONS & PATENT (Full list can be found here)

- Yilong Zhao, Mingyu Gao, Fangxin Liu, Yiwei Hu, Zongwu Wang, Han Lin, Ji Li, He Xian, Hanlin Dong, Tao Yang, Naifeng Jing, Xiaoyao Liang, and Li Jiang, UM-PIM: DRAM-based PIM with Uniform & Shared Memory Space, in *51st International Symposium on Computer Architecture* (ISCA'24)
- Yilong Zhao, Li Jiang, Mingyu Gao, Naifeng Jing, Chengyang Gu, Qidong Tang, Fangxin Liu, Tao Yang, and Xiaoyao Liang, RePAST: A ReRAM-based PIM Accelerator for Second-order Training of DNN, arXiv preprint 2022
- Weidong Cao, **Yilong Zhao(co-first author)**, Adith Boloor, Yinhe Han, Xuan Zhang, and Li Jiang, "Neural-PIM: Efficient Processing-In-Memory with Neural Approximation of Peripherals, " in *IEEE Transactions on Computers*, (TC'21)
- Yilong Zhao, Zhezhi He, Naifeng Jing, Xiaoyao Liang, and Li Jiang. Re2PIM: A Reconfigurable ReRAM-Based PIM Design for Variable-Sized Vector-Matrix Multiplication. In *Proceedings of the 2021 on Great Lakes Symposium on VLSI* (GLSVLSI'21)
- Tao Yang, Dongyue Li, Yibo Han, Yilong Zhao, Fangxin Liu, Xiaoyao Liang, Zhezhi He, Li Jiang, PIMGCN: A ReRAM-Based PIM Design for Graph Convolutional Network Acceleration, ACM/IEEE Design Automation Conference, (DAC'21)
- Zhuoran Song, **Yilong Zhao**, Yanan Sun, Xiaoyao Liang and Li Jiang. "ESNreram: An Energy-Efficient Sparse Neural Network Based on Resistive Random-Access Memory, "*Proceedings of the 2020 on Great Lakes Symposium on VLSI*, (GLSVLSI'2020)
- Chaoqun Chu, Yanzhi Wang, **Yilong Zhao**, Xiaolong Ma, Shaokai Ye, Yunyan Hong, Xiaoyao Liang, Yinhe Han and Li Jiang. "PIM-Prune: Fine-Grain DCNN pruning for Crossbar-based Process-In-Memory architecture, "*ACM/IEEE Design Automation Conference*, (DAC'20)
- Jia Wang, **Yilong Zhao**, Xin Huang and Guangqiang He. "High Speed Polarization-Division Multiplexing Transmissions Based on the Nonlinear Fourier Transform, " *ZTE COMMUNICATIONS* (2019).
- Aiguo Sheng, **Yilong Zhao**, and Guangqiang He, "Characterization of Kerr Solitons in Microresonators with Parameter Optimization and Nonlinear Fourier Spectrum," in *Conference on Lasers and Electro-Optics, OSA Technical Digest* (CLEO'2019)
- Aiguo Sheng, **Yilong Zhao**, and Guangqiang He, "Quadratic soliton combs in doubly resonant half-harmonic generation," in *Nonlinear Optics (NLO), OSA Technical Digest* (NLO'19)

# Patent

- Li Jiang, Yilong Zhao, "Reconfigurable Architecture, Accelerator, Circuit Deployment and Dataflow Methods," Application No. 202010910280.5
- Li Jiang, Yilong Zhao, Xiaosong Cui, Yun Chen, Jianxing Liao, "Neural Network Circuit," Application No. 202010729402.0

### SCIENTIFIC RESEARCH EXPERIENCE

#### Shanghai Jiao Tong University, Advanced Computer Architecture Laboratory,

Supervisor: Prof. Li Jiang

#### **DRAM-PIM** with Shared and Uniform Memory Space

To address the contradiction between PIM and memory interleaving, we design a uniform memory space where CPU memory pages and PIM pages with different interleaving scheme co-exists. Compared to current design, CPU have access to the PIM pages so that we do not need to move data between memory spaces with different interleaving scheme.

#### Shanghai Qizhi Institute

#### A PIM based Second-Order Trainning Accelerator

The purpose of the research is to design a neural network second-order optimizer based on the integration of storage and calculation technology. Including the storage and calculation integration design of some unique operators in the second-order optimization, and the design of the architecture mapping strategy.

#### **PIM Implementation Towards Optical Communication Project**

The purpose of the research is to realize the receiver of optical communication and wireless communication based on the integrated technology of storage and calculation, and is responsible for the following tasks:

- Design the overall architecture of optical communication and wireless communication systems based on the integration of storage and calculation, including operator splitting and algorithm reconstruction.
- Realize the circuit simulation of some operators.
- Aiming at the high-power calculation module to achieve a lower calculation amount than the existing numerical algorithm under the conditions of allowable error.

#### Shanghai Jiao Tong University, Advanced Computer Architecture Laboratory

#### Supervisor: Prof. Li Jiang

#### A Reconfigurable ReRAM-based DNN Accelerator Architecture

Design a ReRAM-based DNN accelerator which can significantly reduce the peripheral circuit's overhead.

- Propose an energy-efficient ReRAM-based accelerator's peripheral circuit implement. Compare to some stateof-art architectures, the architecture improves the energy efficiency by  $5.36 \times$ .
- Design a reconfigurable ReRAM-based DNN accelerator. Compare to some state-of-art architectures, the architecture improves the energy efficiency by  $27 \times$ .

## **ReRAM-based Efficient and Reliable DNN Accelerator Project**

The project investigates the enhancement of computational reliability and the utilizes sparsity to improve energy efficiency in ReRAM-based DNN accelerator. I am responsible for the following work:

#### Jan 2021 – Aug 2022

# Step 2022 - Nov 2023

# Mar 2021 – Aug 2022

## Aug 2019 – Dec 2020

Apr 2019 – Apr 2020

- Design and code a cycle-accurate simulator for the ReRAM-based NN accelerator. The simulator is built based on GEM5.
- Rewrite the simulator to evaluate the reliability and performance of architecture for pruned NN, The results of the simulator are used as an important metric for the project evaluation.
- Design a ReRAM-based DNN accelerator for pruned NN.

#### Laboratory of Quantum Nonlinear Photonics (QNP), SJTU,

#### Supervisor: Prof. Guangqiang He

#### Conditions for the Generation and Evolution of Optical Frequency Combs Mar 2018 – Jun 2018

- Study the evolutionary conditions of optical soliton and optical frequency comb generation in optical microcavities, and build a simulation system.
- Analyze the evolution of an optical frequency comb in an optical microcavity with nonlinear eigenvalues for the first time and obtain the relationship between the number of optical solitons and nonlinear eigenvalues.

#### **Quantum Entangled Optical Frequency Comb Generation and Transmission based on Silicon-based** Micro-nano Resonant Cavity Project

The project investigates the use of nonlinear frequency domain coding to solve the problem of evolutionary decay of optical signals during long distance transmission. I am responsible for the following work:

- Code the nonlinear Fourier transform and its inversion modules in systems with Matlab.
- Construct the fiber optic signal transmission simulation system.

#### University Student Innovation Program, SJTU,

#### Supervisor: Prof. Chunyu Zhao

#### **Development of DTU with Bluetooth Interface Project**

Design a data transmission unit (DTU) circuit with data analysis display program. I am responsible for the following work:

- As the project leader, responsible for the progress and final reporting of the project.
- Designed and developed a DTU, including circuit design, soldering and embedded programming, and solved the problem of electromagnetic interference of the circuit in the application scenario.

TA, Algorithm design and analysis (CS222)

SJTU, 2019-2020 Autumn

June 2017 – Mar 2018

#### Dec 2015 – Dec 2016