JIAQI GU

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EDUCATION

The University of Texas at Austin — Ph.D., Electrical and Computer Engineering — May 2023 (expected)
Integrated Circuits and System Track. Overall GPA 4.00/4.00

Fudan University, Shanghai, China — B.E., Microelectronic Science and Engineering — Jul 2018
(Eminent Engineer Program). Overall GPA: 3.91/4.00

EXPERIENCE

Graduate Research Assistant, The University of Texas at Austin — Jan 2019 – Present

- Designed novel architecture for area-efficient optical neural network based on Fast Fourier Transformation; achieved 3-4x area reduction than previous ONN architectures; Wrote a research paper that was published at *ACM/IEEE ASP-DAC*, *Jan 2020*.
- Developed noise-aware quantization scheme to enable robust optical neural networks with low-precision voltage controls; achieved better accuracy and robustness to limited control resolution and device-level variations than previous methods; Wrote a research paper that will be published at *DATE*, *Mar 2020.*
- Developed on-chip learning algorithm to improve training efficiency and robustness for optical neural networks with stochastic zeroth-order optimization; Wrote a research paper that will be published at *DAC, Jul 2020*.
- Proposed efficient on-chip learning algorithm for optical neural networks with stochastic zeroth-order optimization algorithms; achieved 3-4x higher ONN forward efficiency and better robustness to thermal variation than previous methods.
- Worked on photonic chip tapeout for novel ONN architectures with Synopsys optodesigner.
- Collaborated on the design of photonic recurrent neural networks.
- Helped develop high-performance CUDA kernels for ASIC Placement acceleration with GPUs.

Graduate Research Assistant, The University of Texas at Austin — Sep 2018 – Jan 2019

- Projected RISC-V Rocket Core on Zynq FPGA and achieved communication between them
- Customized FIRRTL transformation and built infrastructure for fault injection and system state snapshot

Research Assistant, Fudan University, Shanghai, China — Aug 2017 – Jul 2018

- Modified infant brain atlas offered by UNC and created complete tissue probability maps
- Developed two-stage reconstruction framework for infant thin-section MR image reconstruction by using GANs and CNN; research is developing brand new method to improve reconstruction performance by fusing multi-planar MR images, and improving PSNR, SSIM, and NMI by 26.2%, 93.4%, and 25.3% respectively compared to bicubic interpolation
- Wrote a research paper that was published at *IEEE Access, May 2019*.

Research Assistant, Fudan University, Shanghai, China — Mar 2016 – Jul 2017

- Developed embedded simulation system on Xilinx Zynq-7000 AP SoC with partial reconfiguration techniques; system allows for end-to-end software/hardware co-design project simulation
- Achieved convenient Wi-Fi connection, flexible development environment, and no network downloading latency
- Designed embedded server and client PC application that could manage simulation requests from multiple users
- Designed FPGA circuits using dynamic partial reconfiguration technique to decouple user logic from simulation system's static logic
- Scheduled user access to on-chip FPGA resources by adopting distributed task queue
- Wrote a research paper that was published at *IEEE 12th International Conference on ASIC, 2017*

PUBLICATIONS

- **Gu, J.**, Zhao, Z., Feng, C., Li, W., Chen, R., Pan, Z. "FLOPS: Efficient On-Chip Learning for Optical Neural Networks Through Stochastic Zeroth-Order Optimization", *ACM/IEEE Design Automation Conference (DAC), San Francisco, CA, Jul. 19-23, 2020*. (accepted)
- Miscuglio, M., Hu, Z., Li, S., **Gu, J.**, Babakhani, A., Gupta, P., Wong, C., Pan, Z., Bank, S., Dalir, H., Sorger, J. "Million-channel parallelism Fourier-optic convolutional filter and neural network processor", *CLEO, San Jose, CA, May 10-15, 2020.*
- Feng, C., Ying, Z., Zhao, Z., **Gu, J.**, Pan, Z., Chen, R. "Integrated WDM-based Optical Comparator for High-speed Computing", *CLEO, San Jose, CA, May 10-15, 2020.*
- Feng, C., Zhao, Z., Ying, Z., **Gu, J.**, Pan, Z., Chen, R. "Compact design of On-chip Elman Optical Recurrent Neural Network", *CLEO, San Jose, CA, May 10-15, 2020.*
- Ying, Z., Feng C., Zhao, Z., Dhar, S., Dalir, H., **Gu, J.**, Cheng, Y., Soref, R., Pan, Z., Chen, R. "Electronic-photonic Arithmetic Logic Unit for High-speed Computing", *Nature Communications, Apr. 2020*.

- **Gu, J.**, Zhao, Z., Feng, C., Chen, R., Pan, Z *et al*. "ROQ: A Noise-Aware Quantization Scheme Towards Robust Optical Neural Networks with Low-bit Controls", *IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE), Grenoble, France, Mar. 09-13, 2020.*
- Liu, M., Zhu, K., **Gu, J.**, Shen, L., Tang, X., Sun, N., Pan, D. "Towards Decrypting the Art of Analog Layout: Placement Quality Prediction via Transfer Learning", *IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE), Grenoble, France, Mar. 09-13, 2020*.
- Feng, C., Ying, Z., Zhao, Z., **Gu, J.**, Pan, D., Chen, R. "Wavelength-division-multiplexing based electronic photonic network for high speed computing", *SPIE Photonics West, San Francisco, CA, United States, Feb. 01-06, 2020*.
- Lin, Y., Li, W., **Gu, J.**, Ren, M., Khailany, B., Pan, D. "ABCDPlace: Accelerated Batch-based Concurrent Detailed Placement on Multi-threaded CPUs and GPUs", *IEEE Transaction on Computer-Aided Design of Integrated Circuits and Systems (TCAD), Feb., 2020*.
- **Gu, J.**, Zhao, Z., Feng, C., Liu, M., Chen, R., Pan, D. "Towards Area-Efficient Optical Neural Networks: An FFT-based Architecture", *ACM/IEEE Asian and South Pacific Design Automation Conference (ASP-DAC), Beijing, China, Jan. 13-16, 2020*. (**Best Paper Award**)
- Zhao, Z., **Gu, J.**, Ying, Z., Feng, C., Chen, R., Pan, D. "Design Technology for Scalable and Robust Photonic Integrated Circuits", *IEEE/ACM International Conference on Computer-Aided Design (ICCAD), Westminster, CO, Nov. 4-7, 2019.* (invited paper)
- **Gu, J.**, Yu, J., Li, Z., Wang, Y., Yang, H., Qiao, Z. "Deep Generative Adversarial Networks for Thin-section Infant MR Image Reconstruction", *IEEE Access, May, 2019*.
- **Gu, J.**, Wang, R., Wang, J., Lai, J., Duan, Q. "Remote Embedded Simulation System for SW/HW Co-design Based On Dynamic Partial Reconfiguration", *IEEE 12th International Conference on ASIC, 2017*.

RELATED GRADUATE COURSES/CERTIFICATE

- Computer Architecture (EE 382N 1)
- High Speed Computer Arithmetic (EE 382N 14)
- Computer Architecture: Parallelism/Locality (EE 382N 20)
- Parallel Algorithm Scientific Computing (CS 395T)
- Reinforcement Learning: Theory & Practice (CS 394R)
- VLSI I (EE 382M.7)
- VLSI Physical Design Automation (EE 382M)
- Cross-layer Machine Learning Algorithm/Hardware Co-design (EE 382V)
- Certificate of NVIDIA workshop on Fundamentals of Accelerated Computing with CUDA Python, NVIDIA DLI, 2019

HONORS

- Best Paper Award, 25th ACM/IEEE Asian and South Pacific Design Automation Conference (ASP-DAC) 2020
- 4th Place, 2019 DAC System Design Contest on Low Power Object Detection 2019
- First Prize Scholarship, Fudan University 2017 – 2018
- Top 5, 2018 HUAWEI & FUTURELAB AI Contest (CV Group) 2018
- Top 11%, 2017 IEEEXtreme Global Programming Competition (out of 3,350 teams worldwide) 2017
- 2nd & 3rd Prize, National Mathematical Contest in Modeling 2016, 2017

ADDITIONAL INFORMATION

Computer Skills: Python（PyTorch/Tensorflow), C/C++, CUDA, Matlab, Verilog
Software: Cadence Virtuoso, Synopsys Hspice, Xilinx Vivado Design Suite**,** Synopsys Optodesigner