

HANQING ZHU

Graduate Research Assistant ◊ ECE Department ◊ University of Texas at Austin
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RESEARCH INTERESTS

- High-performance and reliable AI computing systems with emerging hardware (photonics, MRAM)
- Machine learning and its application in AI computing systems and design automation

EDUCATION

The University of Texas at Austin (UT-Austin), TX, USA

Aug. 2020 – Present

Ph.D. student, Department of Electrical and Computer Engineering

Advisor: David Z. Pan

Co-advisor: Ray T. Chen

(GPA: 3.95/4.00)

Shanghai Jiao Tong University (SJTU), Shanghai, China

Sept. 2016 – Jun. 2020

B.E., Dept. of Microelectronics Science and Engineering

(GPA: 3.81/4.00)

(Rank: 2nd/57)

PROFESSIONAL EXPERIENCE

Google LLC., CA, USA

Jul. 2022 – Nov. 2022

Student Researcher, Google Brain

- Reinforcement Learning for VLSI Macro Placement

HONORS AND AWARDS

| | | |
|---|-------------------------------|-----------|
| Winner at Robert S. Hilbert Memorial Optical Design Competition | Synopsys | 2022 |
| DAC Young Fellow | DAC | 2021 |
| Shanghai Outstanding Graduate | Shanghai City | 2020 |
| Departmental Excellent Undergraduate Thesis | Shanghai Jiao Tong University | 2020 |
| Hongyi Scholarship | Shanghai Jiao Tong University | 2019 |
| Outstanding Undergraduate Scholarship | Shanghai Jiao Tong University | 2019 |
| Samsung Scholarship | Shanghai Jiao Tong University | 2018 |
| Zhiyuan College Honors Scholarship | Shanghai Jiao Tong University | 2018 |
| 1st Prize, National Mathematical Contest in Modeling | Shanghai Division | 2018 |
| Academic Excellence Scholarship | Shanghai Jiao Tong University | 2017-2019 |

RESEARCH EXPERIENCE

The University of Texas at Austin, TX, USA

Aug. 2020 – Present

Graduate Research Assistant, advised by Prof. [David Z. Pan](#) and [Prof Ray T. Chen](#)

- **ML for EDA**
 - Reinforcement learning for Macro placement : Intern project.
 - DREAMPlace quality improvement.
- **Emerging Hardware for Efficient AI Computing**
 - Contribute to the open-source library for photonic AI computing [Torch-ONN](#).
 - Electronic-photonic NN accelerator. [[C1](#), [C5](#), [C6](#), [J1](#), [J3](#), [J4](#)]
 - Photonic in-memory computing. [[J2](#), [C5](#)]
- **Co-design for Efficient and Reliable Emerging Hardware**
 - Model-circuit co-optimization for efficiency enhancement. [[C6](#), [C9](#), [J3](#)]
 - **Reliability-driven optimization**
 - * Aging-aware optimization for Photonic in-memory computing. [[J2](#), [C5](#)]
 - * Quantization and variation-aware training for robustness enhancement. [[C1](#), [C5](#), [J2](#)]
 - On-chip/on-device learning for self-learnable emerging AI hardware. [[C4](#)]

PROFESSIONAL SERVICE

Reviewer

- Nature Photonics (second reviewer)
- Photonic Network Communications
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- IEEE/ACM International Conference on Computer-Aided Design (ICCAD)
- IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS)

TEACHING & VOLUNTEER EXPERIENCES

Graduate Teaching Assistant

- EE316: Digital Logic Design Fall 2022

Volunteer

- Conference Volunteer, the IEEE International Symposium on Circuits and Systems (ISCAS) 2022
- Volunteer Teacher, Eryuan No.2 high school, Yunnan, China Aug. 2017- Sept. 2017
 - Awarded with "Color for love" bronze prize of Chinese college students' rural supporting education

RELATED COURSES

- | | |
|---|--|
| • EE381V: Combinatorial Optimization | <i>Prof. Constantine Caramanis</i> |
| • EE382M: VLSI CAD and Optimization | <i>Prof. David Z. Pan</i> |
| • EE382N: Computer Architecture: Parallelism/Locality | <i>Prof. Mattan Erez</i> |
| • EE381V: Advanced Topics in Computer Vision | <i>Prof. Zhangyang (Atlas) Wang</i> |
| • EE381K: Convex Optimization | <i>Prof. Constantine Caramanis</i> |
| • EE382M: VLSI I | <i>Prof. David Z. Pan</i> |
| • EE382M: VLSI Physical Design Automation | <i>Prof. David Z. Pan</i> |
| • EE382V: Cross-layer Machine Learning Algorithm/Hardware Co-design | <i>Prof. Mattan Erez and Prof. Michael Orshansky</i> |

SKILLS

Programming Languages

Python (PyTorch), C++, CUDA, Verilog

EDA Tools

Cadence Virtuoso, Synopsys Design Compiler, Hspice, Xilinx Vivado Design Suite, Synopsys Optodesigner

PUBLICATIONS

Journal Papers

- [J4] Chenghao Feng*, Jiaqi Gu*, **Hanqing Zhu**, Zhoufeng Ying, Zheng Zhao, David Z. Pan, and Ray T. Chen, "[A compact butterfly-style silicon photonic-electronic neural chip for hardware-efficient deep learning](#)," in *ACS Photonics*, 2022..
- [J3] Jiaqi Gu, Chenghao Feng, **Hanqing Zhu**, Zheng Zhao, Zhoufeng Ying, Mingjie Liu, Ray T. Chen and David Z. Pan, "[SqueezeLight: A Multi-Operand Ring-Based Optical Neural Network with Cross-Layer Scalability](#)," in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, Jul., 2022.
- [J2] **Hanqing Zhu**, Jiaqi Gu, Chenghao Feng, Mingjie Liu, Zixuan Jiang, Ray T. Chen, and David Z. Pan, "[ELight: Towards Efficient and Aging-Resilient Photonic In-Memory Neurocomputing](#)," in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, Jun., 2022.

- [J1] Jiaqi Gu, Chenghao Feng, **Hanqing Zhu**, Ray T. Chen and David Z. Pan, “[Light in AI: Toward Efficient Neurocomputing with Optical Neural Networks - A Tutorial](#),” in *IEEE Transactions on Circuits and Systems–II: Express Briefs (TCAS-II)*, Apr., 2022.

Conference Papers

- [C11] Jiaqi Gu, Zhengqi Gao, Chenghao Feng, **Hanqing Zhu**, Ray Chen, Duane S Boning, and David Z. Pan, “[NeurOLight: A Physics-Agnostic Neural Operator Enabling Parametric Photonic Device Simulation](#),” in *Conference on Neural Information Processing Systems (NeurIPS)*, Nov 26 - Dec 4, 2022. (Accepted)
- [C10] Harrison Jin, **Hanqing Zhu**, Keren Zhu, Thomas Leonard, Mahshid Alamdar, David Z. Pan, and Jean Anne C. Incorvia, “[Design of Domain Wall-Magnetic Tunnel Junction Analog Content Addressable Memory using Current and Projected Prototype Data](#),” in *Annual Conference on Magnetism and Magnetic Materials (MMM)*, Minneapolis, MN, October 31 - November 4, 2022. (Accepted)
- [C9] **Hanqing Zhu**, Keren Zhu, Jiaqi Gu, Harrison Jin, Ray Chen, Jean Anne Incorvia and David Z. Pan, “[Fuse and Mix: MACAM-Enabled Analog Activation for Energy-Efficient Neural Acceleration](#)” in *IEEE/ACM International Conference on Computer-Aided Design (ICCAD)*, Oct., 2022
- [C8] Chenghao Feng, Jiaqi Gu, **Hanqing Zhu**, Zhoufeng Ying, Zheng Zhao, David Z. Pan, and Ray T. Chen, “[Optoelectronically Interconnected Hardware-Efficient Deep Learning using Silicon Photonic Chips](#),” in *Smart Photonic and Optoelectronic Integrated Circuits (SPIE)*, Mar., 2022
- [C7] Chenghao Feng, Jiaqi Gu, **Hanqing Zhu**, David Z. Pan, and Ray T. Chen, “[Design and Experimental Demonstration of A Hardware-Efficient Integrated Optical Neural Network](#),” in *Smart Photonic and Optoelectronic Integrated Circuits (SPIE)*, Mar., 2022
- [C6] Jiaqi Gu, **Hanqing Zhu**, Chenghao Feng, Zixuan Jiang, Mingjie Liu, Shuhan Zhang, Ray T. Chen, and David Z. Pan, “[ADEPT: Automatic Differentiable DEsign of Photonic Tensor Cores](#),” in *ACM/IEEE Design Automation Conference (DAC)*, Jul., 2022
- [C5] **Hanqing Zhu**, Jiaqi Gu, Chenghao Feng, Mingjie Liu, Zixuan Jiang, Ray T. Chen, and David Z. Pan, “[ELight: Enabling Efficient Photonic In-Memory Neurocomputing with Life Enhancement](#),” in *IEEE/ACM Asia and South Pacific Design Automation Conference (ASP-DAC)*, Jan., 2022.
- [C4] Jiaqi Gu, **Hanqing Zhu**, Chenghao Feng, Zixuan Jiang, Ray T. Chen, and David Z. Pan, “[L2ight: Enabling On-Chip Learning for Optical Neural Networks via Efficient in-situ Subspace Optimization](#),” in *Conference on Neural Information Processing Systems (NeurIPS)*, Dec., 2021.
- [C3] Jiaqi Gu, **Hanqing Zhu**, Chenghao Feng, Mingjie Liu, Zixuan Jiang, Ray T. Chen, and David Z. Pan, “[Towards Memory-Efficient Neural Networks via Multi-Level in situ Generation](#),” in *International Conference on Computer Vision (ICCV)*, Oct., 2021.
- [C2] Chenghao Feng, Jiaqi Gu, **Hanqing Zhu**, David Z. Pan, and Ray T. Chen, “[Experimental Demonstration of a WDM-based Integrated Optical Decoder for Compact Optical Computing](#),” in *Conference on Lasers and Electro-Optics*, May, 2021.
- [C1] Jiaqi Gu, Zheng Zhao, Chenghao Feng, **Hanqing Zhu**, Ray T. Chen, and David Z. Pan, “[ROQ: A Noise-Aware Quantization Scheme Towards Robust Optical Neural Networks with Low-bit Controls](#),” in *IEEE Design, Automation & Test in Europe Conference & Exhibition (DATE)*, Mar., 2020.