ZHENGQI, GAO

Tel: +1-(617)7630963 | Email: zhengqi@mit.edu
Homepage: https://zhengqigao.github.io/

EDUCATION

Massachusetts Institute of Technology Cambridge, USA

Ph.D. in Electrical Engineering and Computer Science Sep 2021 – Jun 2026 (Expected)

- GPA: 5.00/5.00 (Rank: NA); worked with Prof. Duane S. Boning
- Research interests: design automation for photonic/electronic integrated circuits and machine learning

Fudan University Shanghai, China

M.S. in Microelectronics and Solid State Electronics Sep 2018 – Jun 2021

- GPA: 3.82/4.00 (Rank: NA); worked with Prof. Jun Tao and Prof. Xin Li (Duke Univ.)
- Research interests: electronic design automation (EDA), and machine learning

B.E. in Microelectronic Science and Engineering Sep 2014 – Jun 2018

- GPA: 3.84/4.00 (Rank: 4/71); selected to Elite Engineering Program (top 5%)
- Relevant coursework: Mathematical Analysis, Probability, Mathematical Statistics and Stochastic Process, Signal and System, Data Structure and Algorithm Design, Design of Analog Integrated Circuits

PUBLICATIONS

Machine Learning

1. Z. Xue*, **Z. Gao***, S. Ren*, and H. Zhao, "The Modality Focusing Hypothesis: Towards Understanding Crossmodal Knowledge Distillation," *International Conference on Learning Representations* (*ICLR oral*), 2023. [PDF] (* indicates equal contribution)
2. **Z. Gao**, F. Sun, M. Yang, S. Ren, Z. Xiong, M. Engeler, A. Burazer, L. Wildling, L. Daniel, and D. S. Boning "Learning from Multiple Annotator Noisy Labels via Sample-wise Label Fusion," *European Conference on Computer Vision (ECCV)*, 2022. [PDF] [Code]
3. J. Gu, **Z. Gao**, C. Feng, H. Zhu, R. T. Chen, D. S. Boning, and D. Z. Pan, "NeurOLight: A Physics-Agnostic Neural Operator Enabling Parametric Photonic Device Simulation," *Conference on Neural Information Processing Systems (Neurips)*, 2022. [PDF]
4. **Z. Gao**, S. Ren, Z. Xue, and H. Zhao, "Training-Free Robust Multimodal Learning via Sample-Wise Jacobian Regularization," *Arxiv Preprint*, 2022. [PDF]
5. S. Ren, H Wang, **Z. Gao**, S. He, A. Yuille, Y. Zhou and C. Xie, "A Simple Data Mixing Prior for Improving Self-Supervised Learning," *IEEE/CVF Conference on Computer Vision and Pattern Recognition* (*CVPR*), Jun. 2022. [PDF]
6. S. Ren, **Z. Gao**, T. Hua, Z. Xue, Y. Tian, S. He and H. Zhao, "Co-Advise: Cross Inductive Bias Distillation," *IEEE/CVF Conference on Computer Vision and Pattern Recognition* (*CVPR*), Jun. 2022. [PDF]
7. Z. Xue, S. Ren, **Z. Gao** and H. Zhao, "Multimodal Knowledge Expansion," *IEEE International Conference on Computer Vision (ICCV)*, Oct. 2021. [PDF]

Design Automation for Photonic/Electronic Integrated Circuits

1. **Z. Gao**, X. Chen, Z. Zhang, U. Chakraborty, W. Bogaerts, and D. S. Boning "Automatic Synthesis of Light Processing Functions for Programmable Photonics: Theory and Realization," *Photonics Research*. [PDF] [Code]
2. C. Li, C. An, **Z. Gao**, F. Yang, Y. Su and X. Zeng, "Unleashing the Power of Graph Spectral Sparsification for Power Grid Analysis via Incomplete Cholesky Factorization," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* (*IEEE TCAD*). [PDF]
3. **Z. Gao**, X. Chen, Z. Zhang, U. Chakraborty, W. Bogaerts, and D. S. Boning "Automatic Synthesis of Light Processing Functions for Programmable Photonics," *IEEE Photonics Conference (IEEE IPC)*, 2022. [PDF]
4. **Z. Gao**, Z. Zhang and D. S. Boning, "Automatic Synthesis of Broadband Silicon Photonic Devices via Bayesian Optimization," *IEEE Journal of Lightwave Technology (IEEE JLT)*. [PDF]
5. **Z. Gao**, Z. Zhang and D. S. Boning, "Automatic Design of a Broadband Directional Coupler via Bayesian

Optimization," *Conference on Lasers and Electro-Optics (CLEO)*, 2022. [PDF]

6. Z. Liang, H. Wang, J. Cheng, Y. Ding, H. Ren, **Z. Gao**, Z. Hu, D. S. Boning, X. Qian, S. Han, W. Jiang, and Y. Shi "Variational Quantum Pulse Learning," *IEEE International Conference on Quantum Computing and Engineering (IEEE QCE)*, 2022. [PDF]
7. **Z. Gao** and R. Rohrer, "Efficient Non-Monte-Carlo Yield Estimation," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* (*IEEE TCAD*). [PDF]
8. **Z. Gao**, J. Tao, Y. Su, D. Zhou, X. Zeng and X. Li, "Fast Statistical Analysis of Rare Failure Events with Truncated Normal Distribution in High-Dimensional Variation Space," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* (*IEEE TCAD*). [PDF]
9. **Z. Gao**, Z. Chen, J. Tao, Y. Sun, D. Zhou, and X. Zeng, "Bayesian Inference on Introduced General Region: An Efficient Parametric Yield Estimation Method for Integrated Circuits," *ACM/IEEE Asia and South Pacific Design Automation Conference* (*ASPDAC*), Jan. 2021. [PDF]
10. **Z. Gao**, J. Tao, D. Zhou, X. Zeng and X. Li, "Efficient Rare Failure Analysis over Multiple Corners via Correlated Bayesian Inference," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* (*IEEE TCAD*), Oct. 2020. [PDF] [Code]
11. **Z. Gao**, J. Tao, D. Zhou and X. Zeng, "Efficient Parametric Yield Estimation over Multiple Process Corners via Bayesian Inference Based on Bernoulli Distribution," *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* (*IEEE TCAD*), Oct. 2020. [PDF] [Code]
12. J. Shi, **Z. Gao**, J. Tao, Y. Su, D. Zhou and X. Zeng, "Multi-Corner Parametric Yield Estimation via Bayesian Inference on Bernoulli Distribution with Conjugate Prior," *IEEE International Symposium on Circuits and Systems* (*ISCAS*), Oct. 2020. [PDF]
13. Y. Li, X. Zeng, **Z. Gao**, L. Lin, J. Tao, J. Han, X. Cheng, M. Tahoori and X. Zeng, "Exploring A Bayesian Optimization Framework Compatible with Digital Standard Flow for Soft-Error-Tolerant Circuit," *IEEE/ACM Design Automation Conference* (*DAC*), Jul. 2020. [PDF]
14. **Z. Gao**, J. Tao, Y. Su, D. Zhou and X. Zeng, "Projection Based Active Gaussian Process Regression for Pareto Front Modeling," *Arxiv Preprint*. [PDF]
15. **Z. Gao**, J. Tao, F. Yang, Y. Su, D. Zhou and X. Zeng, "Efficient Performance Trade-Off Modeling for Analog Circuit Based on Bayesian Neural Network," *IEEE/ACM International Conference on Computer Aided Design* (*ICCAD*), Nov. 2019. [PDF]
16. J. Tao, **Z. Gao**, D. Zhou and X. Zeng, "Efficient Statistical Analysis for Correlated Rare Failure Events," *IEEE International Conference on Solid-State and Integrated Circuit Technology* (*ICSICT*), Nov. 2018. [PDF]

RESEARCH EXPERIENCE

Massachusetts Institute of Technology — Cambridge, USA
Research Assistant to Prof. Duane S. Boning — Sep 2021 – Jun 2026 (expected)

- Investigated neural network uncertainty quantification on regression problem
- Researched on automatic light processing functions synthesis on programmable photonics
- Optimized silicon photonic devices via Bayesian optimization

Shanghai Qizhi Institute — Shanghai, China
Research Assistant to Prof. Hang Zhao — Mar 2021 – Jun 2021

- Exploited multimodal learning under knowledge distillation
- Developed a method to address adversarial attack by utilizing the multimodal data

Southern Methodist University — Remotely
Research Assistant to Prof. Ron Rohrer — May 2020 – Sep 2021

- Built a power grid DC simulator for the electromigration problem
- Analyzed parametric yield based on the adjoint method

Fudan University (State Key Laboratory of ASIC & System) — Shanghai, China
Research Assistant to Prof. Jun Tao (in collaboration with Prof. Xin Li) — Sep 2016 – Jul 2021

- Improved post-silicon yield estimation with the domain adaptation technique
- Estimated multi-corner failure rate and yield with Bayesian inference
- Modeled performance trade-off of analog circuits based on a Bayesian neural network

- Optimized a time variant analog filter by hierarchical clustering (bachelor thesis)
- Developed an SRAM failure-rate estimation tool in collaboration with Prof. Xuan Zhang (WUSTL) [see here]

TEACHING AND INTERNSHIPS

Fudan University (FDU) and Duke Kunshan University (DKU) China
Teaching Assistant Sep 2019 – Mar 2020

- Performed TA duties for Design of Analog Integrated Circuits at FDU (instructor: Prof. Jun Xu) and Introduction to Programming & Data Structure at DKU (instructor: Prof. Dennis Quan [Duke Univ.])

Baidu Inc. Shanghai, China
Quality Assurance (QA) Engineering Intern Jun 2017 – Sep 2017

- Measured the robustness of programs and took charge of the FEEDS project

SELECTED AWARDS AND HONORS

- Outstanding Graduates of Shanghai (top 5%) 2021
- National Scholarship, Fudan University (top 1%) 2020
- Rising Star of Academic, Fudan University (awarded to 11 graduate students majoring in Sci. & Engi.) 2020
- Pacemaker to Merit Student, Fudan University (awarded to 15 graduate students) 2019
- First Prize Scholarship, Fudan University (top 5%) 2019
- National Gold Award, China "Internet+" College Student Innovation & Entrepreneur Competition(top 5%) 2018
- National 2nd Prize, China Post-Graduate Mathematical Contest in Modeling (top 15%) 2018
- Outstanding Undergraduates of Shanghai (top 5%) 2018
- Meritorious Winner, American Mathematical Contest in Modeling (top 13%) 2017
- Top 11%, 2017 IEEE Xtreme Global Programming Competition (out of 3,350 teams worldwide) 2017
- First Prize Scholarship, Fudan University (top 5%) 2015, 2016, 2017
- National 2nd prize, China Mathematical Contest in Modeling (top 15%) 2016

REPRESENTATIVE PROJECTS

***PRML* Solution Manual (GitHub 800+ Stars)** Shanghai, China
An Original Solution Manual for Pattern Recognition and Machine Learning (PRML) Sep 2017 – Present

- Solved nearly all exercises in *PRML* [see here]
- Communicated with people globally via email, helping them solve problems relevant to *PRML*

Auto-Grading System Kunshan, China
An Auto-Grading System Developed at DKU Jan 2020 – Mar 2020

- Led a small TA group to peruse the source code of Submitty
- Developed a fully automatic grading system based on Submitty

"Dr. Stanley's House" (Puzzle Video Game) Written in Haskell Shanghai, China
Final Project for Introduction to Functional Programming: From C/C++ to Haskell Sep 2018 – Jan 2019

- Implemented the game with a complete plot via Haskell [see here]
- Organized the program structure, sorted the logic, and set the schedule as the team leader
- Exploited Haskell libraries (e.g., SDL2, SDL2-ttf, and SDL2-mixer) to add music and animation

ADDITIONAL INFORMATION

Computer and Language Skills

- **Programming languages & Software**: C/C++, MATLAB, Python, Linux, HSPICE, SPECTRE, Lumerical
- **Languages**: Mandarin Chinese (native), English (proficient)

PROFESSIONAL SERVICES

- **Independent reviewer:** ICCAD, IEEE TCAD, CVPR, etc.,