Xiaoxuan Yang

Assistant Professor
Electrical and Computer Engineering Department
University of Virginia

Address: E212 Thornton Hall
351 McCormick Rd
Charlottesville, VA 22904
Email: xiaoxuan@virginia.edu
Google Scholar
Personal Website

Research Interests

- **Efficient Processing-in-Memory-based System Design**
- **Robust and Reliable Hardware-Software Co-Design for Non-Volatile Memory**
- **Biologically Plausible System Design**
- **Neurosymbolic Learning Algorithm and Architecture**

Professional Experience

University of Virginia (UVA) — Aug. 2023 – Present
Assistant Professor, Department of Electrical and Computer Engineering, Jul. 2024 - Present
Rising Scholars Research Scientist, Aug. 2023 – Jul. 2024

Stanford University — Aug. 2023 – Jul. 2024
Postdoctoral Scholar, Robust Systems Group — Host: Dr. Subhasish Mitra

KLA Corporation — May 2019 – Aug. 2019
Research Intern, Advanced Algorithm Group

Sohu, Inc. — Jun. 2017 - Aug. 2017
Technology Intern, Changyan Forum Group

Education

Duke University — Jun. 2023
Ph.D. in Electrical and Computer Engineering — Advisors: Dr. Hai Helen Li and Dr. Yiran Chen
Thesis: Improving the efficiency and robustness of in-memory computing in emerging technologies.

University of California, Los Angeles (UCLA) — Jun. 2018
M.S. in Electrical Engineering — Advisor: Dr. Ramin Ramezani

Tsinghua University — Jul. 2016
B.S. in Electrical Engineering — Advisor: Dr. Chen Shen
Thesis: Power system transient stability evaluation method based on measurement.

Awards

- **Best Student Poster Award in the Area of Artificial Intelligence and Neuromorphic Engineering**, First author by undergraduate student Christopher Wolters, MWSCAS, 2023

- **Machine Learning and Systems Rising Star**, MLCommons, 2023

- **Rising Scholars Postdoc Fellow**, University of Virginia, School of Engineering and Applied Science, 2023-2024

- **NSF iREDEFINE Fellow**, ECE Department Heads Association Annual Conference, 2023

- **Bronze Medal of ACM Student Research Competition SRC** at International Conference on Computer-Aided Design (ICCAD), 2022

- **Rising Star in Electrical Engineering and Computer Science (EECS)**, 2022 [Duke Engineering News]

- **Best Research Award at ACM SIGDA Ph.D. Forum** at Design Automation Conference (DAC), 2022
- **Travel Awards** for ML & Sys Workshop 2023, iREDEFINE Workshop 2023, ACM SRC @ ICCAD 2022, ACM Ph.D. Forum @ DAC 2022, and IGSC 2021
- **Duke Graduate School Conference Travel Award**, 2022
- **Duke Electrical and Computer Engineering Conference Travel Fellowship**, 2022
- **Duke Electrical and Computer Engineering Diversity Award**, 2018
- **Henry Samueli Fellowship**, UCLA, 2018
- **Zheng-Geru Academic Scholarship**, Tsinghua University, 2015
- **Cai-Xiong Academic Scholarship**, Tsinghua University, 2013

Publications

Underline denotes my students in UVA; Star denotes equal contribution.

Journal Articles

[1] X. Wu, E. Hanson, N. Wang, Q. Zheng, **X. Yang**, H. Yang, S. Li, F. Cheng, P. P. Pande, J. R. Doppa, K. Chakrabarty, and H. H. Li. "Block-Wise Mixed-Precision Quantization: Enabling High Efficiency for Practical ReRAM-based CNN Accelerators." *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, vol. 43, no. 12, pp. 4558-4571, Dec. 2024, DOI: 10.1109/TCAD.2024.3409193.

[2] **X. Yang**, Z. Wang, X. S. Hu, C. H. Kim, S. Yu, M. Pajic, R. Manohar, Y. Chen, and H. H. Li. "Neuro-Symbolic Computing: Advancements and Challenges in Hardware-Software Co-Design." *IEEE Transactions on Circuits and Systems II: Express Briefs (TCAS-II)*, vol. 71, no. 3, pp. 1683-1689, March 2024, DOI: 10.1109/TCSII.2023.3336251

[3] **X. Yang**, H. Yang, J. R. Doppa, P. P. Pande, K. Chakrabarty, and H. H. Li. "ESSENCE: Exploiting Structured Stochastic Gradient Pruning for Endurance-aware ReRAM-based In-Memory Training Systems." *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, vol. 42, no. 7, pp. 2187-2199, July 2023, DOI: 10.1109/TCAD.2022.3216546.

[4] C. Wu, **X. Yang**, Y. Chen, and M. Li. "Photonic Bayesian Neural Network using Programmed Optical Noises." *IEEE Journal of Selected Topics in Quantum Electronics (JSTQE)*, vol. 29, no. 2: Optical Computing, pp. 1-6, March-April 2023, Art no. 6100606, DOI: 10.1109/JSTQE.2022.3217819.

[5] **X. Yang**, C. Wu, M. Li, and Y. Chen. "Tolerating Noise Effects in Processing-in-Memory Systems for Neural Networks: A Hardware–Software Codesign Perspective". *Advanced Intelligent System*, 2200029 (2022), DOI: 10.1002/aisy.202200029.

[6] **X. Yang***, B. Taylor*, A. Wu, Y. Chen, and L. O. Chua. "Research Progress on Memristor: From Synapses to Computing Systems." *IEEE Transactions on Circuits and Systems I: Regular Papers (TCAS-I)*, vol. 69, no. 5, pp. 1845-1857, May 2022, DOI: 10.1109/TCSI.2022.3159153. [**Selected as TCAS-I Highlight**]

[7] C. Wu, **X. Yang**, H. Yu, R. Peng, I. Takeuchi, Y. Chen, and M. Li. "Harnessing Optoelectronic Noises in a Photonic Generative Network." *Science Advances* 8, no. 3 (2022): eabm2956. DOI: 10.1126/sciadv.abm2956. [**ScienceDaily News**][**UW ECE News**]

Conference Proceedings

[8] <u>P. Chen</u> and **X. Yang**. "Exploring and Optimizing System Performance in Compact Processing-in-Memory-based Chips." In *IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, 2025. Accepted.

[9] B. Taylor, **X. Yang**, and H. H. Li. "Weight Update Scheme for 1T1R Memristor Array Based Equilibrium Propagation." In *IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, pp. 388-392. 2024, DOI: 10.1109/AICAS59952.2024.10595934.

[10] C. Wolters, B. Taylor, E. Hanson, **X. Yang**, U. Schlichtmann, and Y. Chen. "Biologically Plausible Learning on Neuromorphic Hardware Architectures." In *IEEE International Midwest Symposium on Circuits and Systems (MWSCAS)*, pp. 733-737. 2023, DOI: 10.1109/MWSCAS57524.2023.10405905. [**Best Student Poster Award**]

[11] **X. Yang**, S. Li, Q. Zheng, and Y. Chen. "Improving the Robustness and Efficiency of PIM-based Architecture by SW/HW Co-Design." In *Proceedings of the 28th Asia and South Pacific Design Automation Conference (ASP-DAC)*, pp. 618-623. 2023, DOI: 10.1145/3566097.3568358.

[12] J. Henkel, H. H. Li, A. Raghunathan, M. B. Tahoori, S. Venkataramani, **X. Yang**, and G. Zervakis. "Approximate Computing and the Efficient Machine Learning Expedition." In *Proceedings of the 41st International Conference on Computer-Aided Design (ICCAD)*, pp. 1-9. 2022, DOI: 10.1145/3508352.3561105.

[13] **X. Yang**, H. Yang, J. Zhang, H. H. Li, and Y. Chen. "On Building Efficient and Robust Neural Network Designs." In *2022 56th Asilomar Conference on Signals, Systems, and Computers (ASILOMAR)*, pp. 317-321. 2022, DOI: 10.1109/IEEECONF56349.2022.10051891.

[14] **X. Yang***, H. Yang*, N. Z. Gong, and Y. Chen. "HERO: Hessian-Enhanced Robust Optimization for Unifying and Improving Generalization and Quantization Performance." In *Proceedings of 59th Design Automation Conference (DAC)*, pp. 25-30. 2022, DOI: 10.1145/3489517.3530678. [**Rank First in the Track**]

[15] C. Wu, **X. Yang**, H. Yu, I. Takeuchi, Y. Chen, and M. Li. "Optical Generative Adversarial Network based on Programmable Phase-change Photonics." In *CLEO: Science and Innovations*, pp. STu1G-3. Optical Society of America, 2021, DOI: 10.1364/CLEO_SI.2021.STu1G.3.

[16] **X. Yang**, S. Belakaria, B. K. Joardar, H. Yang, J. R. Doppa, P. P. Pande, K. Chakrabarty, and H. H. Li. "Multi-Objective Optimization of ReRAM Crossbars for Robust DNN Inferencing under Stochastic Noise." In *Proceedings of the 40th International Conference on Computer-Aided Design (ICCAD)*, pp. 1-9. 2021, DOI: 10.1109/ICCAD51958.2021.9643444.

[17] **X. Yang**, B. Yan, H. H. Li, and Y. Chen. "ReTransformer: ReRAM-based Processing-In-Memory Architecture for Transformer Acceleration." In *Proceedings of the 39th International Conference on Computer-Aided Design (ICCAD)*, pp. 1-9. 2020, DOI: 10.1145/3400302.3415640. [**Rank First in the Track**]

Peer Reviewed Conference Abstract

[18] C. Wu, **X. Yang**, H. Yu, R. Peng, I. Takeuchi, Y. Chen, and M. Li, "Photonic Generative Adversarial Network (GAN) with Noise-aware Training." *Progress in Electromagnetics Research Symposium (PIERS)*, Aug. 2021.

Preprint

[19] C. Wolters, **X. Yang**, U. Schlichtmann, and T. Suzumura. "Memory is All You Need: An Overview of Computing-in-Memory Architectures for Accelerating Large Language Model Inference", 2024, DOI: 10.48550/arXiv.2406.08413.

Mentorship

- **Hanyuan Gao**
  Current: Graduate student at UVA, Computer Engineering
  Research Topic: *Computer architecture and design for symbolic/NN model.*
- **Xinyuan Fu**
  Current: Graduate student at UVA, Computer Engineering
  Research Topic: *Low power design.*
- **Peilin Chen**
  Current: Graduate student at UVA, Electrical Engineering
  Research Topic: *Digital/mixed-signal IC and computing-in-memory design.*
  Collaborated Paper: [AICAS2025].

- **Carson Jenkins**
  Current: Undergraduate student at UVA, Electrical Engineering and Mechanical Engineering
- **Junting Huo**
  Current: Undergraduate student at UVA, Electrical and Computer Engineering
- **Christopher Wolter**
  Current: Graduate student at Technical University of Munich
  Research Topic: *Biologically plausible learning hardware architectures.*
  Collaborated Papers: [MWSCAS2023] and [Arxiv: survey2024].

Student Award

- Peilin Chen, UVA Provost's Fellowship, 2024-Present.

Teaching

- **Instructor for ECE 2330 Digital Logic Design** Spring 2025
  Enrollment: 87
  - Guide students to understand fundamental logic principles and build computational modules with hardware description language VHDL.
  - Reconstruct learning activities to establish a strong foundation for the final project.
  - Record learning activities to facilitate self-learning.
- **Guest Lecturer for ECE 4501/6501 AI Hardware** Fall 2024
  Topic: Resistive Random Access Memory Based Processing in Memory Design.
- **TA for Enterprise Storage Architecture** Fall 2020
  Instructor: Dr. Tyler K Bletsch
- **TA for Introduction to Signals and Systems** Spring 2020
  Instructor: Dr. Vahid Tarokh
- **TA for Neural Signal Processing** Spring 2018
  Instructor: Dr. Kao Jonathan

Service Activities

Conference and Workshop Service

- Publications Chair, International Green and Sustainable Computing Conference IGSC, 2024
- Organizing Committee Member, NSF Workshop on Hardware-Software Co-design for Neuro-Symbolic Computation, 2024
- Organizing Committee Member, NSF PI Meeting of the Computer Systems Research (CSR) Program, 2023
- Panelist, Army Research Office (ARO) Workshop on Machine Learning-enabled Hardware and Software Co-Design for Intelligent CPS (MLiCPS), 2024
- Special Session Chair, Frontiers in Edge AI: Technology, Algorithms, and Emerging Trends, ICCAD, 2023
- Session Chair, Power Management and Hardware-Level Efficiency, International Green and Sustainable Computing Conference IGSC, 2024
- Session Chair, AI Efficiency From Far Memory to Cross-Platform Performance, DAC, 2024
- Session Chair, Reconfigurable Accelerators Meet Heterogeneous Architectures, DAC, 2023
- Session Chair, Repeal Murphy's Law: Avoid Errors, DAC, 2022

Technical Program Committee

- TPC, Great Lakes Symposium on VLSI (GLSVLSI), 2025, 2024
- TPC, Design and Automation Conference, 2025
- TPC, TinyML Research Symposium, 2025, 2024
- TPC, Asia and South Pacific Design Automation Conference ASP-DAC, 2025

- TPC, AAAI Conference on Artificial Intelligence (AAAI), 2025, 2024, 2023
- TPC, International Green and Sustainable Computing Conference IGSC, 2024
- PC, IEEE Computer Society Annual Symposium on VLSI ISVLSI, 2024
- TPC, CASES: International Conference on Compiler, Architectures, and Synthesis for Embedded Systems, 2024

Panel and Proposal Review Service
- NSF Computer Systems Research (CSR) Program, 2024
- Department of Energy (DOE), Office of Science, 2024

Departmental Service
- Faculty Search Committee Member, Department of Electrical and Computer Engineering, University of Virginia, 2024-2025
- Qualify Exam Evaluation Committee, Department of Electrical and Computer Engineering, University of Virginia, 2024

Education Outreach
- Panelist for "Science & Engineering Exploration in Durham (SEED)" at First Year Students Orientation, 2022
- Volunteer in "COSMOS Education Toolkit @ Inspiring Minds" at Hillside High School, Durham, 2023

Journal Reviewer
- ACM Journal on Emerging Technologies in Computing Systems (JETC)
- ACM Transactions on Design Automation of Electronic Systems (TODAES)
- ACM Transactions on Embedded Computing Systems (TECS)
- IEEE Access
- IEEE Design & Test (D&T)
- IEEE Embedded Systems Letters (ESL)
- IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS)
- IEEE Journal of Exploratory Solid-State Computational Devices and Circuits (JxCDC)
- IEEE Transactions on Circuits and Systems I: Regular Papers (TCAS-I)
- IEEE Transactions on Circuits and Systems for Artificial Intelligence (TCASAI)
- IEEE Transactions on Computers (TC)
- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
- IEEE Transactions on Consumer Electronics (T-CE)
- IEEE Transactions on Emerging Topics in Computing (TETC)
- IEEE Transactions on Neural Networks and Learning Systems (TNNLS)
- IEEE Transactions on Reliability (TR)
- IEEE Transactions on Very Large Scale Integration Systems (TVLSI)
- Science China Information Sciences

Conference and Workshop Reviewer
- ACM SIGDA Ph.D. Forum at Design Automation Conference (DAC), 2024
- IEEE International Symposium on Circuits and Systems (ISCAS), 2024
- ACM Student Research Contest (SRC) at International Conference on Computer-Aided Design (ICCAD), 2023
- Embedded System Software Competition (ESSC) at Embedded Systems Week (ESWEEK), 2023
- Asilomar Conference on Signals, Systems, and Computers (ASILOMAR), 2022, 2024
- IEEE International Conference on Artificial Intelligence Circuits & Systems (AICAS), 2021

Professional Affiliations
- Member of Institute of Electrical and Electronics Engineers (IEEE)
- Member of Association of Computing Machinery (ACM)
- Member of IEEE Circuits and Systems Society
- Member of ACM Special Interest Group in Design Automation (SIGDA)