Xiaoxuan Yang

Assistant Professor
Charles L. Brown Electrical and Computer Engineering Department
University of Virginia

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Research Interests

- Efficient Processing-in-Memory-based System Design
- Robust and Reliable Hardware-Software Co-Design
- Biologically Plausible System Design

Professional Experience

- **Assistant Professor**, Dept. of Electrical and Computer Eng., University of Virginia, Jul. 2024 - Present
- **Postdoc**, Robust Systems Group, Hosted by Dr. Subhasish Mitra, Stanford University, Aug. 2023 – Jul. 2024
- **Rising Scholars Research Scientist**, University of Virginia, Aug. 2023 – Jul. 2024
- **Research Intern**, Advanced Algorithm Group, KLA Corporation, May 2019 – Aug. 2019
- **Technology Intern**, Changyan Forum Group, Sohu, Inc., Jun. 2017 - Aug. 2017

Education

- **Ph.D.** in Electrical and Computer Engineering, Duke University, June 2023
  Advisors: Dr. Hai Helen Li and Dr. Yiran Chen
  Thesis: Improving the efficiency and robustness of in-memory computing in emerging technologies.
- **M.S.** in Electrical Engineering, University of California, Los Angeles (UCLA), June 2018
  Advisor: Dr. Ramin Ramezani
- **B.S.** in Electrical Engineering, Tsinghua University, July 2016
  Advisor: Dr. Chen Shen
  Thesis: Power system transient stability evaluation method based on measurement.

Awards

1. **Best Paper Award** for the paper titled "Titanus: Enabling KV Cache Pruning and Quantization On-the-Fly for LLM Acceleration", ACM Great Lakes Symposium on VLSI (GLSVLSI), 2025
2. **Best Student Poster Award** in the Area of Artificial Intelligence and Neuromorphic Engineering for paper titled "Biologically Plausible Learning on Neuromorphic Hardware Architectures", IEEE International Midwest Symposium on Circuits and Systems (MWSCAS), 2023
3. **Highlight Paper of the Month** for the paper titled "Research Progress on Memristor: From Synapses to Computing Systems", IEEE Transactions on Circuits and Systems I: Regular Papers (TCAS-I), 2022
4. **Bronze Medal of ACM Student Research Competition SRC** at IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2022
5. **Best Research Award at ACM SIGDA/IEEE CEDA Ph.D. Forum** at Design Automation Conference (DAC), 2022
6. Machine Learning and Systems Rising Star, MLCommons, 2023
7. Rising Scholars Postdoc Fellow, University of Virginia, School of Engineering & Applied Science, 2023-2024
8. NSF iREDEFINE Fellow, ECE Department Heads Association Annual Conference, 2023
9. Rising Star in Electrical Engineering and Computer Science (EECS), University of Texas, Austin, 2022
10. Duke Electrical and Computer Engineering Diversity Award, 2018

11. Travel Awards for ML Sys Workshop 2023, iREDEFINE Workshop 2023, ACM SRC at ICCAD 2022, ACM Ph.D. Forum at DAC 2022, and IGSC 2021
12. Duke Graduate School Conference Travel Award, 2022
13. Duke Electrical and Computer Engineering Conference Travel Fellowship, 2022
14. Henry Samueli Fellowship, UCLA, 2018
15. Zheng–Geru Academic Scholarship, Tsinghua University, 2015
16. Cai–Xiong Academic Scholarship, Tsinghua University, 2013

Publications

Underline denotes supervised students at UVA; Star denotes equal contribution.

Journal Articles

[J8] H. Shan, C. Wei, N. Ramos, **X. Yang**, C. Guo, H. H. Li, and Y. Chen. "Neuromorphic Computing in the Era of Large Models.", *Artificial Intelligence Science and Engineering (AISE)*, vol. 1, no. 1, pp. 17-30, March 2025, DOI: 10.23919/AISE.2025.000002.

[J7] 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.

[J6] **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.

[J5] **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.

[J4] 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.

[J3] **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.

[J2] **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]**

[J1] 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

[C13] H. Gao and **X. Yang**. "Norm-Q: Effective Compression Method for Hidden Markov Models in Neuro-Symbolic Applications.", *Asilomar Conference on Signals, Systems, and Computers (ASILOMAR)*, 2025, Accepted. DOI: 10.48550/arXiv.2509.25439.

[C12] P. Chen and **X. Yang**. "Titanus: Enabling KV Cache Pruning and Quantization On-the-Fly for LLM Acceleration." In *Proceedings of the Great Lakes Symposium on VLSI (GLSVLSI)*, 71–77, 2025, DOI: 10.1145/3716368.3735145; 10.48550/arXiv.2505.17787. **[Rank First in the Track]** **[Best Paper Award]**

[C11] F. Cheng, T. Zhang, J. Zhang, J. Ku, Y. Wang, **X. Yang**, H. H. Li, and Y. Chen. "AutoRAC: Automated Processing-in-Memory Accelerator Design for Recommender Systems." In *Proceedings of the Great Lakes Symposium on VLSI (GLSVLSI)*, 791–797, 2025, DOI: 10.1145/3716368.3735229; 10.48550/arXiv.2505.10748.

[C10] P. Chen 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, DOI: 10.1109/AICAS64808.2025.11173147; 10.48550/arXiv.2502.21259.

[C9] 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.

[C8] 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**]

[C7] **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.

[C6] 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; 10.48550/arXiv.2210.00497.

[C5] **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.

[C4] **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; 10.48550/arXiv.2111.11986. [**Rank First in the Track**]

[C3] 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.

[C2] **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; 10.48550/arXiv.2109.05437.

[C1] **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

[A1] 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.

Technical Report and Archived Paper

[P2] **X. Yang**, M. Pajic, A. Wang, R. Manohar, and H. H. Li. "A Report for NSF Workshop on Hardware-Software Co-design for Neuro-Symbolic Computation", 2025, Available: sites.duke.edu/nsfnscworkshop2024/.

[P1] 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.

Research Mentorship

Ph.D. Students

- **Hanyuan Gao**
  Current: Graduate student at UVA, Computer Engineering.
  Collaborated Paper: [C13].
- **Peilin Chen**
  Current: Graduate student at UVA, Electrical Engineering.
  Collaborated Papers: [C12] and [C10].

Undergraduate Students

- **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 (TUM)
  Research Topic: *Biologically plausible learning hardware architectures.*
  Collaborated Papers: [C8] and [P1].

Student Awards

- Peilin Chen, DAC Young Fellow, 2025.
- Hanyuan Gao, DAC Young Fellow, 2025.
- Peilin Chen, UVA Provost's Fellowship, 2024-2029.

Teaching and Advising

- **Instructor for ECE 4501/6501 Hardware-Software Co-Design for Machine Learning** Fall 2025
  Enrollment: 25
- **Instructor for ECE 2330 Digital Logic Design** Spring 2025
  Enrollment: 87
- **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 Organization

- 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

Conference and Workshop Panel

- Speaker, AI at the Edge, Link Lab Research Day, 2025

- Speaker, Neuromorphic Testbeds: Pioneering Energy-Efficient Computing For the Future, Design and Automation Conference (DAC), 2025
- Panelist, Army Research Office (ARO) Workshop on Machine Learning-enabled Hardware and Software Co-Design for Intelligent CPS (MLiCPS), 2024

Conference Session Chair

- Session Chair, IoT and Smart Systems, GLSVLSI, 2025
- Session Chair, Smarter Compute, Faster Inference: Optimizing AI Systems on Edge, DAC, 2025
- Tutorial Session Chair, Introduction to Foundation AI Models, DAC, 2025
- Session Chair, Power Management and Hardware-Level Efficiency, IGSC, 2024
- Session Chair, AI Efficiency From Far Memory to Cross-Platform Performance, DAC, 2024
- Special Session Chair, Frontiers in Edge AI: Technology, Algorithms, and Emerging Trends, ICCAD, 2023
- Session Chair, Reconfigurable Accelerators Meet Heterogeneous Architectures, DAC, 2023
- Session Chair, Repeal Murphy's Law: Avoid Errors, DAC, 2022

Technical Program Committee

- International Conference on Computer-Aided Design (ICCAD), 2025
- Great Lakes Symposium on VLSI (GLSVLSI), 2025, 2024
- Design and Automation Conference (DAC), 2025
- TinyML Research Symposium, 2025, 2024
- Asia and South Pacific Design Automation Conference (ASP-DAC), 2025
- International Conference On VLSI Design (VLSID), 2025
- AAAI Conference on Artificial Intelligence (AAAI), 2025, 2024, 2023
- International Green and Sustainable Computing Conference (IGSC), 2024
- IEEE Computer Society Annual Symposium on VLSI (ISVLSI), 2024
- CASES: International Conference on Compiler, Architectures, and Synthesis for Embedded Systems, 2024

Proposal Review

- Swiss National Science Foundation (SNSF), Ambizione, 2025
- NSF Computer Systems Research (CSR) Program, 2024
- Department of Energy (DOE), Office of Science, 2024

Education Outreach

- Founding Committee, IEEE Region 3 Central Virginia Section Young Professional (YP) Group, 2025
- Judge and Reviewer, Ph.D. Forum at Design Automation Conference (DAC), 2025, 2024
- Judge and Reviewer, ACM Student Research Contest (SRC) at International Conference on Computer-Aided Design (ICCAD), 2023
- Volunteer in "COSMOS Education Toolkit @ Inspiring Minds" at Hillside High School, Durham, 2023
- Panelist for "Science & Engineering Exploration in Durham (SEED)" at First Year Students Orientation, 2022

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)
- Nature Communications (as Early Career Researcher)
- Science China Information Sciences

Conference and Workshop Reviewer

- IEEE International Symposium on Circuits and Systems (ISCAS), 2024
- Embedded System Software Competition (ESSC) at Embedded Systems Week (ESWEEK), 2023
- Asilomar Conference on Signals, Systems, and Computers (ASILOMAR), 2024, 2022
- 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 (CASS)
- Member of IEEE Council on Electronic Design Automation(CEDA)
- Member of ACM Special Interest Group in Design Automation (SIGDA)

Departmental Service

- ECE Bylaws Committee, 2025
- Faculty Search Committee, 2024-2025
- Rising Scholar Search Committee, 2025
- Qualify Exam Evaluation, 2025, 2024

Ph.D. Proposal and Thesis Committee

- University of Virginia: Yasas Nayomal Seneviratne, CS; Charles David Hess, ECE.