

Lixue Xia

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Education

- 2013 - 2018 **Tsinghua University** Beijing, China
Ph.D. (with honors) in Department of Electronic Engineering
Thesis: *Key Technologies of Energy-efficient ReRAM-based Neural Network Computing Systems*
Advisor: Prof. Yu Wang, Associate Prof. Rong Luo
- 2009 - 2013 **Tsinghua University** Beijing, China
B.S. in Electronic Engineering

Professional Experience

- 2018.07-now **Alibaba Group** Beijing, China
Senior Research and Development Engineer, Computing Platform BU
- 2017 **Duke University** NC, U.S.
Visiting Scholar, Department of ECE
- 2013.11-2014.05 **Microsoft Research Asia** Beijing, China
Intern, Hardware Computing Group

Research Summary

Lixue Xia has published 28 papers, including 5 journal (4 IEEE) and 23 conference (5 DAC, 5 DATE, 1 ICCAD, 4 ASPDAC, 1 VLSI Symp., 1 IEDM) papers in the area of EDA, with a focus on deep learning hardware and parallel circuit analysis. He received the Best Paper Nominations in DAC 2017 and ITC 2018. Lixue's publications have been cited by more than 400 times in Google Scholar, and his H10-index is 14.

Service Summary

Lixue Xia has been an active volunteer in the design automation. He is a reviewer for IEEE Trans. on CAD, IEEE Trans. on NNSL, IEEE JETCAS, JCSC, and academic conferences. He was invited to give talks in ACA 2016, CTC 2016, and to other academic groups.

Awards and Honors

- 2018 **Outstanding Doctor Graduate** of Tsinghua University (76/2259 in the university, 3/59 in the department).
- 2018 **Outstanding Doctor Degree Dissertation** of Tsinghua University (6/59 in the department).
- 2018 **Outstanding Doctor Graduate** of Beijing.
- 2018 **Best Paper Candidate**, IEEE International Test Conference (ITC). (Paper [Cxx])
- 2017 **National Scholarship**, China.
- 2017 **Best Paper Candidate**, Design Automation Conference (DAC). (Paper [Cxx])
- 2017 **Ph.D. Forum scholarship** of Design Automation Conference (DAC).
- 2016 **ICFC Ph.D. Scholarship**, Beijing Innovation Center for Future Chips.
- 2015 **"Star of Tomorrow" Excellent Internship**, Microsoft Research Asia (MSRA).
- 2014 **Academic Scholarship**, Tsinghua University.
- 2014 **Second Prize** in Ph.D. forum, Department of Electronic Engineering, Tsinghua University.
- 2013 **Outstanding B.S. Thesis**, Department of Electronic Engineering, Tsinghua University.

Journal Publications

- [J1] **Lixue Xia**, Wenqin Huangfu, Tianqi Tang, Xiling Yin, Krishnendu Chakrabarty, Yuan Xie, Yu Wang, Huazhong Yang, “Stuck-at Fault Tolerance in RRAM Computing Systems”, in *IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS)*, vol.8, No.1, 2018, pp.102-115.
- [J2] **Lixue Xia**, Boxun Li, Tianqi Tang, Peng Gu, Pai-yu Chen, Shimeng Yu, Yu Cao, Yu Wang, Yuan Xie, Huazhong Yang, “MNSIM: Simulation Platform for Memristor-based Neuromorphic Computing System”, in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, vol.37, No.5, 2018, pp.1009-1022.
- [J3] **Lixue Xia**, Mengyun Liu, Xuefei Ning, Krishnendu Chakrabarty, Yu Wang, “Fault-Tolerant Training Enabled by On-Line Fault Detection for RRAM-Based Neural Computing System”, to appear in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, 2018.
- [J4] **Lixue Xia**, Peng Gu, Boxun Li, Tianqi Tang, Xiling Yin, Wenqin Huangfu, Shimeng Yu, Yu Cao, Yu Wang, Huazhong Yang, “Technological Exploration of RRAM Crossbar Array for Matrix-Vector Multiplication”, in *Journal of Computer Science and Technology (JCST)*, vol.31, No.1, 2016, pp.3-19.
- [J5] Ming Cheng, **Lixue Xia**, Zhenhua Zhu, Yi Cai, Yuan Xie, Yu Wang, Huazhong Yang, “TIME: A Training-in-memory Architecture for RRAM-based Deep Neural Networks”, to appear in *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)*, 2018.

Conference Publications

- [C1] **Lixue Xia**, Mengyun Liu, Xuefei Ning, Krishnendu Chakrabarty, Yu Wang, “Fault-Tolerant Training with On-Line Fault Detection for RRAM-Based Neural Computing Systems”, in *ACM/EDAC/IEEE Design Automation Conference (DAC)*, 2017, pp.1-6.
- [C2] **Lixue Xia**, Tianqi Tang, Wenqin Huangfu, Ming Cheng, Xiling Yin, Boxun Li, Yu Wang, Huazhong Yang, “Switched by Input: Power Efficient Structure for RRAM-based Convolutional Neural Network”, in *ACM/EDAC/IEEE Design Automation Conference (DAC)*, 2016, pp.125:1-125:6.
- [C3] **Lixue Xia**, Boxun Li, Tianqi Tang, Peng Gu, Xiling Yin, Wenqin Huangfu, Pai-Yu Chen, Shimeng Yu, Yu Cao, Yu Wang, Yuan Xie and Huazhong Yang, “MNSIM: Simulation Platform for Memristor-based Neuromorphic Computing System”, in *Design, Automation & Test in Europe Conference & Exhibition (DATE)*, 2016, pp.469-474.
- [C4] **Lixue Xia**, Rong Luo, Bin Zhao, Yu Wang, Huazhong Yang, “An Accurate and Low Cost PM2.5 Estimation Method Based on Artificial Neural Network”, in *Asia and South Pacific Design Automation Conference (ASP-DAC)*, 2015, pp.190-195.
- [C5] Yu Wang (advisor), **Lixue Xia**, Tianqi Tang, Boxun Li, Song Yao, Ming Cheng, Huazhong Yang, “Low Power Convolutional Neural Networks on a Chip”, in *IEEE International Symposium on Circuits and Systems (ISCAS)*, 2016, pp.129-132.
- [C6] Yu Wang (advisor), **Lixue Xia**, Ming Cheng, Tianqi Tang, Boxun Li, Huazhong Yang, “RRAM Based Learning Acceleration”, in *Compliers, Architectures, and Synthesis of Embedded Systems (CASES)*, 2016, pp.1-2.
- [C7] Jilan Lin, **Lixue Xia**, Zhenhua Zhu, Hanbo Sun, Yi Cai, Hui Gao, Ming Cheng, Xiaoming Chen, Yu Wang and Huazhong Yang, “Rescuing Memristor-based Computing with Non-linear Resistance Levels”, in *Design, Automation & Test in Europe Conference & Exhibition (DATE)*, 2018, pp.407-412.
- [C8] Mengyun Liu, **Lixue Xia**, Yu Wang, Krishnendu Chakrabarty, “Design of Fault-Tolerant Neuromorphic Computing Systems”, in *European Test Symposium (ETS)*, 2018.
- [C9] Mengyun Liu, **Lixue Xia**, Yu Wang, Krishnendu Chakrabarty, “Fault Tolerance for RRAM-Based Matrix Operations”, in *International Test Conference (ITC)*, 2018. (Best Paper Candidate)
- [C10] Wenqin Huangfu, **Lixue Xia**, Ming Cheng, Xiling Yin, Tianqi Tang, Boxun Li, Krishnendu Chakrabarty, Yuan Xie, Yu Wang, Huazhong Yang, “Computation-Oriented Fault-Tolerance Schemes for RRAM Computing Systems”, in *Asia and South Pacific Design Automation Conference (ASP-DAC)*, 2017, pp.794-799.
- [C11] Tianqi Tang, **Lixue Xia**, Boxun Li, Yu Wang, Huazhong Yang, “Binary Convolutional Neural Network on RRAM”, in *Asia and South Pacific Design Automation Conference (ASP-DAC)*, 2017, pp.782-787.
- [C12] Ming Cheng, **Lixue Xia**, Zhenhua Zhu, Yi Cai, Yuan Xie, Yu Wang, Huazhong Yang, “TIME:A Training-in-memory Architecture for Memristor-based Deep Neural Network”, in *ACM/EDAC/IEEE Design Automation Conference (DAC)*, 2017, pp.26:1-26:6.
- [C13] Xiaoming Chen, **Lixue Xia**, Yu Wang, Huazhong Yang, “Sparsity-Oriented Sparse Solver Design for Circuit Simulation”, in *Design, Automation & Test in Europe Conference & Exhibition (DATE)*, 2016, pp.1580-1585.

- [C14] Boxun Li, **Lixue Xia**, Peng Gu, Yu Wang, and Huazhong Yang, “Merging the interface: Power, area and accuracy co-optimization for RRAM crossbar-based mixed-signal”, to appear in *ACM/EDAC/IEEE Design Automation Conference (DAC)*, 2015, pp.13:1-13:6.
- [C15] Tianqi Tang, **Lixue Xia**, Boxun Li, Rong Luo, Yu Wang, Yiran Chen, Huangzhong Yang, “Spiking Neural Network with RRAM : Can We Use it for Real-World Application?”, to appear in *Design, Automation & Test in Europe Conference & Exhibition (DATE)*, 2015, pp.860-865.
- [C16] Yi Cai, Yujun Lin, **Lixue Xia**, Xiaoming Chen, Song Han, Yu Wang, Huazhong Yang, “Long Live TIME: Improving Lifetime for Training-In-Memory Engines by Structured Gradient Sparsification”, in *ACM/EDAC/IEEE Design Automation Conference (DAC)*, 2018.
- [C17] Yi Cai, Tianqi Tang, **Lixue Xia**, Ming Cheng, Zhenhua Zhu, Yu Wang, Huazhong Yang, “Training Low Bitwidth Convolutional Neural Networks on RRAM”, to appear in *Asia and South Pacific Design Automation Conference (ASP-DAC)*, 2018, pp.117-122.
- [C18] Fang Su, Wei-Hao Chen, **Lixue Xia**, Chieh-Pu Lo, Tianqi Tang, Zhibo Wang, Kuo-Hsiang Hsu, Ming Cheng, Jun-Yi Li, Yuan Xie, Yu Wang, Meng-Fan Chang, Huazhong Yang, Yongpan Liu, “A 462GOPS/J RRAM-Based Nonvolatile Intelligent Processor for Energy Harvesting IoE System Featuring Nonvolatile Logics and Processing-In-Memory”, in *IEEE Symposium on VLSI Circuits (VLSIC)*, 2017.
- [C19] Yu Wang, Tianqi Tang, **Lixue Xia**, Boxun Li, Peng Gu, Hai Li, Yuan Xie, Huazhong Yang, “Energy Efficient RRAM Spiking Neural Network for Real Time Classification”, in *Great Lakes Symposium on VLSI (GLSVLSI)*, 2015, pp.189-194.
- [C20] Keni Qiu, Weiwen Chen, Yuanchao Xu, **Lixue Xia**, Yu Wang, Zili Shao, “A Low Power Design Enabled by a Peripheral Circuit Reuse Structure integrated with a Retimed Data Flow for RRAM Crossbar-based Convolutional Neural Network”, in *Design, Automation & Test in Europe Conference & Exhibition (DATE)*, 2018.
- [C21] Zhenhua Zhu, Jilan Lin, Ming Cheng, **Lixue Xia**, Hanbo Sun, Xiaoming Chen, Yu Wang and Huazhong Yang, “Mixed Size Crossbar based RRAM CNN Accelerator with Overlapped Mapping Method”, in *IEEE/ACM International Conference on Computer-Aided Design (ICCAD)*, 2018.
- [C22] Yuanhui Ni, Keni Qiu, Weiwen Chen, **Lixue Xia**, Yu Wang, “Low Power Driven and Multi-CLP aware Loop Tiling for RRAM Crossbar-based CNN”, in *ACM/SIGAPP Symposium On Applied Computing (SAC)*, 2018.
- [C23] Shimeng Yu, Pai-Yu Chen, Yu Cao, **Lixue Xia**, Yu Wang, Huaqiang Wu, “Scaling-up Resistive Synaptic Arrays for Neuro-inspired Architecture: Challenges and Prospect”, in *IEEE International Electron Devices Meeting (IEDM)*, 2015, pp.451-454.

Presentations

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| 2016 | Invited Talk, Advanced Computer Architecture (ACA 16)
“RRAM-based Neural Computing System” | Weihai, Shandong, China |
| 2016 | Invited Talk, China Testing Conference
“Switched by Input: Power Efficient Structure for RRAM-based Convolutional Neural Network” | Nantong, Jiangsu, China |

Service and Activities

Reviewers

- 2016 - now Reviewer of Conferences (e.g., ETS’16), IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems (TCAD), IEEE Transactions on Neural Networks and Learning Systems (TNNLS), IEEE Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS), and Journal of Circuits, Systems and Computers (JCSC).