Bingzhe Li

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WORK

Oklahoma State University Aug. 2020 - Now
Assistant Professor in Electrical and Computer Engineering

University of Minnesota, Twin Cities Aug. 2018 – Jul. 2020
Postdoctoral Associate in Computer Science and Engineering
Supervisor: David H.C. Du

University of Minnesota, Twin Cities Jul. 2013 – Aug. 2018
Research Assistant in Electrical and Computer Engineering

Seagate Technology May 2016 – Aug. 2016
Research Intern: Solid-State Drive Modeling and Algorithm Design

EDUCATION

University of Minnesota, Twin Cities Jul. 2011 – Aug. 2018
Ph.D. in Electrical Engineering
Advisor: Prof. David J. Lilja
Dissertation: "Distributed Edge Computing Infrastructure with Low Hardware Cost, Performance Evaluation, and Reliability"

East China Jiaotong University Sep. 2006 – Jul. 2010
B.S. in Electrical Engineering

TEACHING

ECEN 4232: Computer Architecture Oklahoma State University, Spring 2021
Instructor

ECEN 5362: VLSI Digital System Design Oklahoma State University, Fall 2020
Instructor

CS8211: Advanced Computer Networks and Their Applications University of Minnesota, Fall 2018
Teaching Assistant

EE5371: Computer Systems Performance Measurement and Evaluation University of Minnesota, Fall 2016
Teaching Assistant

GRANTS

National Science Foundation
Sole PI: SHF: Small: Exploring and Enhancing Capabilities of Emerging Hybrid/Convertible Solid-State Drives
$583,947, 08/01/2022 – 07/31/2025, NSF (CCF-2208317)

National Science Foundation
Stie PI: Collaborative Research: CNS Core: Small: Efficient Ways to Enlarge Practical DNA Storage Capacity by Integrating Bio-Computer Technologies
$300,000, 07/15/2022 – 06/30/2025, NSF (CNS-2204657)

Oklahoma State University
Sole PI: Research Recovery for Building a Fast and Energy-Efficient Artificial Intelligence Infrastructure
$12,005, 01/01/2022 – 12/31/2022

PUBLICATIONS

Conferences

1. **[ICCAD'22]** Qian Wei, Zhaoyan Shen, Yiheng Tong, Zhiping Jia, Lei Ju, Jiezhi Chen and Bingzhe Li, "Re-LSM: A ReRAM-based Processing-in-Memory Framework for LSM-based Key-Value Store", 2022 41th International Conference on Computer-Aided Design. (132/586=22.5%)
2. **[NAS'22]** Milan Shetti, Bingzhe Li and David H.C. Du, "Machine Learning-based Adaptive Migration Algorithm for Hybrid Storage Systems", 16th IEEE International Conference on Networking, Architecture, and Storage (NAS 2022)
3. [**ASP-DAC'22**] Yuhong Song, Edwin Hsing-Mean Sha, Qingfeng Zhuge, Rui Xu, Yongzhuo Zhang, Bingzhe Li, and Lei Yang, "BSC: Block-based Stochastic Computing to Enable Accurate and Efficient TinyML", The 27th Asia and South Pacific Design Automation Conference (ASP-DAC 2022)
4. [**ICCD'21**] Zehao Chen, Bingzhe Li, Xiaojun Cai, Zhiping Jia, Zhaoyan Shen, Yi Wang and Zili Shao, "Block-LSM: An Ethereum-aware Block-ordered LSM-tree based Key-Value Storage Engine", 2021 The 39th IEEE International Conference on Computer Design (ICCD).
5. [**ICCD'21**] Bingzhe Li, Bo Yuan and David Du, "EFM: Elastic Flash Management to Enhance Performance of Hybrid Flash Memory", 2021 The 39th IEEE International Conference on Computer Design (ICCD).
6. [**ICCD'21**] Bingzhe Li, and David Du, "WAS-Deletion: Workload-Aware Secure Deletion Scheme for Solid-State Drives", 2021 The 39th IEEE International Conference on Computer Design (ICCD).
7. [I**SPA'21**] Milan Shetti, Bingzhe Li, and David Du, "E-VM: An Elastic Virtual Machine Scheduling Algorithm to Minimize the Total Cost of Ownership in a Hybrid Cloud", The 19th IEEE International Symposium on Parallel and Distributed Processing with Applications. (Accepted)
8. **[Systor'21]** Bingzhe Li, Li Ou, and David Du, "IMG-DNA: Approximate DNA Storage for Images", The 14th ACM International Systems and Storage Conference.
9. **[Systor'21]** Jinfeng Yang, Bingzhe Li, and David Lilja, "HeuristicDB: A Hybrid Storage Database System Using a Non-Volatile Memory Block Device", The 14th ACM International Systems and Storage Conference.
10. **[DAC'21]** Yungang Pan, Zhiping Jia, Zhaoyan Shen, Bingzhe Li, Wanli Chang, and Zili Shao, "Reinforcement Learning-Assisted Cache Cleaning to Mitigate Long-Tail Latency in DM-SMR", 2021 58th ACM/IEEE Design Automation Conference (DAC)
11. [**HotStorage'20**] Bingzhe Li, Nae Young Song, Li Ou, and David Du, "Can We Store the Whole World's Data in DNA Storage? ", 12th USENIX Workshop on Hot Topics in Storage and File Systems.
12. [**ICCAD'19**] Bingzhe Li, Chunhua Deng, Jinfeng Yang, David Lilja, Bo Yuan, and David Du, "HAML-SSD: A Hardware Accelerated Hotness Aware Machine Learning based SSD Management", The 2019 IEEE/ACM International Conference on Computer-Aided Design.
13. [**HotStorage'19**] Fenggang Wu, Bingzhe Li, etc., "ZoneAlloy: Elastic Data and Space Management for Hybrid SMR Drives", The 11th USENIX Workshop on Hot Topics in Storage and File Systems.
14. [**GLSVLSI'19**] Bingzhe Li*, Jiaxi Hu*, etc., "Low Cost Hybrid Spin-CMOS based Neural Network Design Using Stochastic Approximate Adder". The 29th edition of the ACM Great Lakes Symposium on VLSI. (*equally contribute)
15. [**GLSVLSI'19**] Bingzhe Li, David Du, "TASecure: Temperature-Aware Secure Deletion Scheme for Solid State Drives", The 29th edition of the ACM Great Lakes Symposium on VLSI.
16. [**FAST'19**] Zhichao Cao, Shiyong Liu, Fenggang Wu, Guohua Wang, Bingzhe Li, and David Du, "Sliding Look-back Window Assisted Data Chunk Rewriting for Improving Deduplication Restore Performance" 17th USENIX Conference on File and Storage Technologies (FAST'19). 2019.
17. [**ISQED'19**] M. Hassan Najafi, Sayed Abdolrasoul Faraji, Bingzhe Li, David Lilja, and Kia Bazargan, "Using Resolution Splitting to Enhance Performance of Deterministic Bit-Stream Computing" 20th International Symposium on Quality Electronic Design.
18. [**DATE'19**] M. Hassan Najafi, Sayed Abdolrasoul Faraji, Bingzhe Li, David Lilja, and Kia Bazargan, "Energy-Efficient Convolutional Neural Networks with Deterministic Bit-Stream Processing" 2019 Design, Automation & Test in Europe Conference & Exhibition (DATE). IEEE, 2019.
19. [**ISQED'18**] **Bingzhe Li**, M. Hassan Najafi, Bo Yuan, and David J. Lilja. "Quantized Neural Networks with New Stochastic Multipliers", 19th International Symposium on Quality Electronic Design (ISQED'18).
20. [**UEMCON'18**] Yaobin Qin, Bingzhe Li, and David J. Lilja, "Enhancing the Ensemble of Exemplar-SVMs for Binary Classification Using Concurrent Selection and Ensemble Learning", The 9th IEEE Annual Ubiquitous Computing, Electronics & Mobile Communication Conference.
21. [**IWLS'18**] M. Hassan Najafi, Sayed Abdolrasoul Faraji, Bingzhe Li, David Lilja and Kia Bazargan, "Using Resolution Splitting to Enhance Performance of Deterministic Bit-Stream Computing", 27th International Workshop on Logic & Synthesis.

22. [**NAS'18**] Bingzhe Li, et al., "Tier-code: An XOR-based RAID-6 Code with Improved Write and Degraded-mode Read Performance" Networking, Architecture and Storage (NAS), 2018 IEEE International Conference on. IEEE, 2018.
23. [**HotStorage'18**] Fenggang Wu, Baoquan Zhang, Zhichao Cao, Hao Wen, Bingzhe Li, Jim Diehl, Guohua Wang, and David H.C. Du, "Data Management Design for Interlaced Magnetic Recording", The 10th USENIX Workshop on Hot Topics in Storage and File Systems.
24. [**ISVLSI'18**] Meng Yang, Bingzhe Li, David Lilja, and Weikang Qian, "Towards Theoretical Cost Limit of Stochastic Number Generators for Stochastic Computing", VLSI (ISVLSI), 2018 IEEE Computer Society Annual Symposium on. IEEE, 2018
25. [**ICCD'17**] **Bingzhe Li**, Yaobin Qin, Bo Yuan, and David Lilja, "Neural Network Classifiers using Stochastic Computing with a Hardware-Oriented Approximate Activation Function", ICCD 2017, The 35th IEEE International Conference on Computer Design.
26. [**NAS'17**] **Bingzhe Li**, et al. "TraceRAR: An I/O Performance Evaluation Tool for Replaying, Analyzing, and Regenerating Traces." Networking, Architecture, and Storage (NAS), 2017 International Conference on. IEEE, 2017.
27. [**ICPADS'17**] Manas Minglani, Jim Diehl, Xiang Cao, Bingzhe Li, Dongchul Park, David J. Lilja and David H.C. Du, "Kinetic Action: Performance Analysis of Integrated Key-Value Storage Devices vs. LevelDB Servers", IEEE ICPADS 2017: International Conference on Parallel and Distributed Systems.
28. [**FPGA'16**] Bingzhe Li, M. Hassan Najafi, and David J. Lilja. "Using Stochastic Computing to Reduce the Hardware Requirements for a Restricted Boltzmann Machine Classifier." Proceedings of the 2016 ACM/SIGDA International Symposium on Field-Programmable Gate Arrays. ACM, 2016.
29. [**NAS'16**] Bingzhe Li, Manas Minglani, and David Lilja. "Ps-Code: A New Code for Improved Degraded Mode Read and Write Performance of RAID Systems." Networking, Architecture and Storage (NAS), 2016 IEEE International Conference on. IEEE, 2016.
30. [**ASAP'15**] Bingzhe Li, M. Hassan Najafi, and David J. Lilja. "An FPGA implementation of a Restricted Boltzmann Machine classifier using stochastic bit streams.", Application specific Systems, Architectures and Processors (ASAP), 2015 IEEE 26th International Conference on. IEEE, 2015.

Journals

31. **[ACM TECS'22]** Qian Wei, Bingzhe Li, Wanli Chang, Zhiping Jia, Zhaoyan Shen, and Zili Shao, "A Survey of Blockchain Data Management Systems", ACM Transactions on Embedded Computing Systems (2022).
32. **[ACM TOS'21]** Fenggang Wu, Bingzhe Li, and David Du, "FluidSMR: Adaptive Management for Hybrid SMR Drives", ACM Transactions on Storage, Volume 17Issue 4, November 2021, Article No.: 32pp 1–30, https://doi.org/10.1145/3465404 (2021)
33. **[IEEE ACCESS'21]** Lintao Xian, Bingzhe Li, Jing Liu, Zhongwen Guo, and David Du, "H-PS: A Heterogeneous-aware Parameter Server with Distributed Neural Network Training", IEEE Access (2021)
34. **[IEEE TC'20]** Fenggang Wu, Bingzhe Li, Baoquan Zhang, Zhichao Cao, Jim Diehl, Hao Wen, and David HC Du. "TrackLace: Data Management for Interlaced Magnetic Recording." IEEE Transactions on Computers (2020).
35. **[ACM TOMPECS'20]** Jinfeng Yang, Bingzhe Li, and David J. Lilja. "Exploring Performance Characteristics of the Optane 3D Xpoint Storage Technology." ACM Transactions on Modeling and Performance Evaluation of Computing Systems (TOMPECS) 5, no. 1 (2020): 1-28.
36. [**IEEE T-ED'19**] Jiaxi Hu*, Bingzhe Li*, etc., "Scalable Stochastic Architecture with Spin-based Number Generator" IEEE Transactions on Electron Devices (*equally contribute).
37. [**ACM JETC'19**] Bingzhe Li, M. Hassan Najafi, and David Lilja, "Low-Cost Stochastic Hybrid Multiplier for Quantized Neural Networks", ACM Journal on Emerging Technologies in Computing Systems (JETC) 2019
38. [**ACM JETC'19**] Bingzhe Li, Yaobin Qin, Bo Yuan, and David Lilja, "Neural Network Classifiers using a Hardware-based Approximate Activation Function with a Hybrid Stochastic Multiplier" ACM Journal on Emerging Technologies in Computing Systems (JETC) 2019
39. [**Elsevier Performance Evaluation'19**] Bingzhe Li, Hao Wen, Farnaz Toussi, Clark Anderson, Bernard A. Ling-Smith, David Lilja and David H.C. Du, "NetStorage: A Synchronized Trace-Driven Replayer for Network-Storage System Evaluation", Performance Evaluation. 2019

Patents

40. M. Hassan Najafi, S. Rasoul Faraji, Bingzhe Li, David J. Lilja, and Kia Bazargan, "Resolution Splitting for Bit-Stream Processing", U.S. Patent Application Number: 62/864,798, Type: Provisional, Filing Date: June 2019.
41. Bingzhe Li, M. Hassan Najafi, and David J. Lilja, "Low-Cost Stochastic Hybrid Multiplier for Quantized Neural Networks", U.S. Patent Application Number: 62/817,343, Type: Provisional, Filing Date: March 2019.
42. Han Shi, Bingzhe Li, and Fangcheng Gan, "Intelligent asphalt spreading amount control apparatus", Publication number: CN201413459 Y, Publication type: Grant, Publication date: Feb 24, 2010

ACADMEIC & UNIVERSITY SERVICES

Journal Editor:

- Associate editor of Neural processing letter

Conference Organization Committee:

- Registration chair: IEEE International Symposium on Workload Characterization (IISWC) 2021
- Registration chair: IEEE International Conference on Computer Design (ICCD) 2021

Program Committee:

- Design Automation Conference (DAC) 2020, 2021, 2022
- IEEE International Conference on Computer Design (ICCD) 2020
- IEEE Computer Society Annual Symposium on VLSI (ISVLSI 2019)
- IEEE International Workshop on Signal Processing Systems (SiPS 2019)

Reviewer:

- Nature Communication
- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
- IEEE Transactions on Very Large-Scale Integration Systems (TVLSI)
- IEEE Transactions on Electron Devices (T-ED)
- Journal of Systems Architecture
- IEEE Internet of Things Journal
- IET Circuits, Devices & Systems
- ACM Transactions on Design Automation of Electronic Systems (TODAES)
- Frontiers of Information Technology & Electronic Engineering
- International Symposium on Circuits and Systems (ISCAS 2018 2019)
- IEEE International Conference on Communications (ICC 2019)
- International Conference on Supercomputing (ICS 2017)
- International Conference on Parallel Architectures and Compilation Techniques (PACT 2017)
- IEEE International Symposium on Performance Analysis of Systems and Software (ISPASS 2016)

Session Chair:

- IEEE International Conference on Computer Design (ICCD) 2020