

# Congming Gao

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PROFESSIONAL EXPERIENCES	<b>Xiamen University</b> , Xiamen, China		
	▪ Associate Professor	Sep 2022 – Now	
	<b>Tsinghua University</b> , Beijing, China		
	▪ Postdoctoral Researcher	Jul 2020 – Aug 2022	
EDUCATION	<b>City University of Hong Kong</b> , Hong Kong, China		
	▪ Senior Research Assistant in Computer Science • Adviser: Prof. Chun Jason Xue	Nov 2019 – May 2020	
	<b>University of Pittsburgh</b> , Pittsburgh, USA		
	▪ Joint Ph.D. Student of Electrical and Computer Engineering • Adviser: Prof. Jun Yang	Oct 2018 – Oct 2019	
	<b>Chongqing University</b> , Chongqing, China		
	▪ Ph.D. Student in Computer Science • Adviser: Prof. Edwin H. -M. Sha Prof. Liang Shi • Cumulative GPA: 3.89 / 4.00	Sep 2014 – Jun 2020	
	<b>City University of Hong Kong</b> , Hong Kong, China		
▪ Research Assistant in Computer Science • Adviser: Prof. Chun Jason Xue	Jul 2015 – Sep 2015		
	<b>Chongqing University</b> , Chongqing, China		
	▪ Bachelor in Computer Science • Cumulative GPA: 3.69 / 4.00	Sep 2010 – Jun 2014	
PUBLICATIONS	<b>CONFERENCES (*CORRESPONDING AUTHOR)</b>		
	[30] <b>Congming Gao</b> , Jiancong Zheng, Xufeng Yang, Qiao Li, Jian Chen, Tianyu Ren, Zheng Wan, Yina Lv, Xin Xin, Min Ye, Chun Jason Xue, Jiwu Shu “LOONG: Utilizing Long-Stride Reprogram to Enhance the Performance of SSDs” in <i>Proceeding of the 53rd Annual International Symposium on Computer Architecture, ISCA</i> , Jun 2026.		
	[29] Yina Lv, Wenhao Zhu, Qiao Li, Quanqing Xu, <b>Congming Gao</b> , Chuanhui Yang, Xiaoli Wang, Chun Jason Xue “Tetris: Lightweight Hyperparameter Auto-Tuning for Mitigating Performance Spikes in LSM-KVS” in <i>Proceeding of the 42nd IEEE International Conference on Data Engineering, ICDE</i> , May 2026.		
	[28] Xufeng Yang, Tingting Tan, Jingxin Hu, <b>Congming Gao*</b> , Mingyang Liu, Tianyang Jiang, Jian Chen, Linbo Long, Yina Lv, Jiwu Shu “Nemo: A Low-Write-Amplification Cache for Tiny Objects on Log-Structured Flash Devices” in <i>Proceeding of the International Conference on Architectural Support for Programming Languages and Operating Systems, ASPLOS</i> , Mar 2026.		
	[27] Dingcui Yu, Zonghuan Yan, Yunpeng Song, Yanyun Wang, Xinghui Duan, <b>Congming Gao</b> , Yina Lv, Liang Shi “ZoneFit: Enabling Zoned Flash Benefits via Granularity-Matched SLC Management” in <i>Proceeding of the 14th IEEE Non-Volatile Memory Systems and Applications Symposium, NVMSA</i> , Aug 2025. (Best Paper Award)		
	[26] Chao Wu, Cheng Ji*, Li-Pin Chang, Zongwei Zhu, <b>Congming Gao*</b> , Weichao Guo, Chao Yu, and Yanzhi Wang “MedFS: Pursuing Low Update Overhead via Metadata-Enabled Delta Compression for Log-structured File System on Mobile Device” in <i>Proceeding of the 23rd USENIX Conference on File and Storage Technologies, FAST</i> , Feb 2025.		
	[25] Jian Chen, <b>Congming Gao*</b> , Youyou Lu, Yuhao Zhang and Jiwu Shu* “Ares-Flash: Efficient Parallel Integer Arithmetic Operations Using NAND Flash Memory” in <i>Proceeding of the 57th IEEE/ACM International Symposium on Microarchitecture, MICRO</i> , Nov 2024.		

- [24] Xufeng Yang, Jiancong Zheng and **Congming Gao\*** “In-place Switch: Reprogramming based SLC Cache Design for Hybrid 3D SSDs” in *Proceeding of the 17th International Conference on Networking, Architecture, and Storage, NAS*, Nov 2024.
- [23] Yumiao Zhao, Jiancong Zheng, Gangyong Jia, Liang Shi and **Congming Gao\*** “Hook: A Pattern Locality Guided Prefetch with Enhanced Read Performance for Hybrid SSDs” in *Proceeding of the 13th IEEE Non-Volatile Memory Systems and Applications Symposium, NVMSA*, Aug 2024. (Best Paper Award)
- [22] Zhenhua Tan, Linbo Long, Jingcheng Shen, **Congming Gao**, Renping Liu and Yi Jiang “Para-ZNS: Improving Small-zone ZNS SSDs Parallelism through Dynamic Zone Mapping” in *Proceeding of the Design, Automation & Test in Europe Conference & Exhibition, DATE*, Mar 2024.
- [21] Qiao Li, Hongyang Dang, Zheng Wan, **Congming Gao\***, Min Ye, Jie Zhang, Tei-Wei Kuo and Chun Jason Xue “Midas Touch: Invalid-Data Assisted Reliability and Performance Boost for 3D High-Density Flash” in *Proceeding of the IEEE International Symposium on High-Performance Computer Architecture, HPCA*, Mar 2024.
- [20] Jingcheng Shen, Lang Yang, Linbo Long, Renping Liu, Zhenhua Tan, **Congming Gao** and Yi Jiang “Overlapping Aware Zone Allocation for LSM Tree-Based Store on ZNS SSDs” in *Proceeding of the Asia and South Pacific Design Automation Conference, ASP-DAC*, Jan 2024.
- [19] Tianmeng Zhang, Renhui Chen, **Congming Gao\***, Youtao Zhang, Jun Yang and Jiwu Shu “Libra: A Space-Efficient, High-Performance Inline Deduplication for Emerging Hybrid Storage System” in *Proceeding of the IEEE International Symposium on Parallel & Distributed Processing with Applications, ISPA*, Dec 2023.
- [18] Mengquan Li, Chao Wu, **Congming Gao**, Cheng Ji and Kenli Li “RLAlloc: A Deep Reinforcement Learning-Assisted Resource Allocation Framework for Enhanced Both I/O Throughput and QoS Performance of Multi-Streamed SSDs” in *Proceeding of the Design Automation Conference, DAC*, Jul 2023.
- [17] Zhenhua Tan, Linbo Long, Renping Liu, **Congming Gao**, Yi Jiang and Yan Liu “Optimizing Data Migration for Garbage Collection in ZNS SSDs” in *Proceeding of the Design, Automation & Test in Europe Conference & Exhibition, DATE*, Apr 2023.
- [16] Yina Lv, Liang Shi, Qiao Li, **Congming Gao**, Yunpeng Song, Longfei Luo, Youtao Zhang “MGC: Multiple-Gray-Code for 3D NAND Flash based High-Density SSDs” in *Proceeding of the 29th IEEE International Symposium on High-Performance Computer Architecture, HPCA*, Mar 2023.
- [15] **Congming Gao**, Xin Xin, Youyou Lu, Youtao Zhang, Jun Yang and Jiwu Shu “ParaBit: Processing Parallel Bitwise Operations in NAND Flash Memory based SSDs” in *Proceeding of the 54th Annual IEEE/ACM International Symposium on Microarchitecture, MICRO*, Oct 2021.
- [14] Cheng Ji, Li-Pin Chang, Riwei Pan, Chao Wu, **Congming Gao**, Liang Shi, Tei-Wei Kuo and Chun Jason Xue “Pattern-Guided File Compression with User-Experience Enhancement for Log-Structured File System on Mobile Devices” in *Proceeding of the 19th USENIX Conference on File and Storage Technologies, FAST*, Feb 2021.
- [13] **Congming Gao**, Min Ye, Qiao Li, Chun Jason Xue, Youtao Zhang, Liang Shi and Jun Yang “Constructing Large, Durable and Fast SSD System via Reprogramming 3D TLC Flash Memory” in *Proceeding of the 52nd IEEE/ACM International Symposium on Microarchitecture, MICRO*, Oct 2019.
- [12] Cheng Ji, Lun Wang, Qiao Li, **Congming Gao**, Liang Shi, Chia-Lin Yang and Chun Jason Xue “Fair Down to the Device: A GC-Aware Fair Scheduler for SSD” in *Proceeding of the 8th IEEE Non-Volatile Memory Systems and Applications Symposium, NVMSA*, Aug 2019.
- [11] Yina Lv, Liang Shi, Qiao Li, **Congming Gao**, Chun Jason Xue and Edwin Sha “Optimizing Tail Latency of LDPC based Flash Memory Storage Systems Via Smart Refresh” in *Proceeding of the 14th International Conference on Networking, Architecture, and Storage, NAS*, Aug 2019.
- [10] **Congming Gao**, Liang Shi, Chun Jason Xue, Jun Yang and Youtao Zhang “Parallel all the time: Plane Level Parallelism Exploration for High Performance SSDs” in *Proceeding of the 35th International Conference on Massive Storage Systems and Technology, MSST*, May 2019.

- [9] Qi Li, Aosong Deng, **Congming Gao**, Yu Liang, Liang Shi and Edwin Sha “Optimizing Fragmentation and Segment Cleaning for CPS based Storage Devices” in *Proceeding of the 34th ACM/SIGAPP Symposium On Applied Computing, SAC*, Apr 2019.
- [8] **Congming Gao**, Yejia Di, Aosong Deng, Duo Liu, Cheng Ji, Chun Jason Xue and Liang Shi “Flash Friendly File System Aware Mapping Cache Design on Solid State Drives” in *Proceeding of the 7th IEEE Non-Volatile Memory Systems and Applications Symposium, NVMSA*, Oct 2018.
- [7] Yejia Di, Liang Shi, **Congming Gao**, Qiao Li and Chun Jason Xue “Revisiting Wear Leveling Design on Compression Applied 3D NAND Flash Memory” in *Proceeding of the International Conference on Hardware/Software Codesign and System Synthesis, CODES+ISSS*, Aug 2018.
- [6] **Congming Gao**, Liang Shi, Yejia Di, Qiao Li, Chun Jason Xue and Edwin H.-M. Sha “An Efficient Cache Management Scheme for Capacitor Equipped Solid State Drives” in *Proceeding of the Great Lakes Symposium on VLSI, GLSVLSI*, May 2018.
- [5] Yejia Di, Liang Shi, **Congming Gao**, Qiao Li, Kaijie Wu and Chun Jason Xue “Loss is Gain: Shortening Data for Lifetime Improvement on Low-Cost ECC Enabled Consumer-Level Flash Memory” in *Proceeding of the Great Lakes Symposium on VLSI, GLSVLSI*, May 2018.
- [4] Yejia Di, Liang Shi, **Congming Gao**, Kaijie Wu, Chun Jason Xue and Edwin H.-M. Sha “Minimizing cell-to-cell interference by exploiting differential bit impact characteristics of scaled MLC NAND flash memories” in *Proceeding of the 5th IEEE Non-Volatile Memory Systems and Applications Symposium, NVMSA*, Jun 2016.
- [3] Qiao Li, Liang Shi, **Congming Gao**, Kaijie Wu, Jason Chun Xue, Qingfeng Zhuge and H.-M. Edwin Sha “Maximizing IO Performance via Conflict Reduction for Flash Memory Storage Systems” in *Proceeding of the Design, Automation & Test in Europe Conference, DATE*, Mar 2015.
- [2] **Congming Gao**, Liang Shi, Kaijie Wu, Chun Jason Xue, and Edwin H.-M. Sha “Exploit Asymmetric Error Rates of Cell States to Improve the Performance of Flash Memory Storage Systems” in *Proceeding of the 32nd IEEE International Conference on Computer Design, ICCD*, Oct 2014.
- [1] **Congming Gao**, Liang Shi, Mengying Zhao, Chun Jason Xue, Kaijie Wu, and Edwin Sha “Exploiting Parallelism in IO Scheduling for Access Conflict Minimization in Flash-based Solid State Drives” in *Proceeding of the 30th International Conference on Massive Storage Systems and Technology, MSST*, Jun 2014.

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- [22] Fangzheng Wang, **Congming Gao**, Bohong Zhu and Jiwu Shu “AtRS: Auto-tuning RAID system with GAN” *Future Generation Computer Systems, FGCS*, Jul 2025.
- [21] Jingcheng Shen, Lang Yang, Linbo Long, Zhenhua Tan, **Congming Gao**, Kan Zhong, Masao Okita, Fumihiko Ino “Overlapping Aware Data Placement Optimizations for LSM Tree-Based Store on ZNS SSDs” *ACM Transactions on Architecture and Code Optimization, TACO*, Mar 2025.
- [20] Dongdong Hao, **Congming Gao** and Jiwu Shu “Design of User Space Storage Architecture for SCSI Subsystem (in Chinese)” *Journal of Computer Research and Development*, Oct 2024.
- [19] Zhenhua Tan, Linbo Long, Jingcheng Shen, Renping Liu, **Congming Gao**, Kan Zhong and Yi Jiang “Optimizing Garbage Collection for ZNS SSDs via In-storage Data Migration and Address Remapping” *ACM Transactions on Architecture and Code Optimization, TACO*, Aug 2024.
- [18] Xiangyu Yao, Qiao Li, Kaihuan Li, Xinbiao Gan, Jie Zhang, **Congming Gao**, Zhirong Shen, Quanqing Xu, Chuanhui Yang, Chun Jason Xue “Extremely-Compressed SSDs with I/O Behavior Prediction” *ACM Transactions on Storage, TOS*, Jul 2024.
- [17] Renhui Chen, Tianmeng Zhang, Zijing Li, **Congming Gao\***, Youtao Zhang, Qiao Li, Jun Yang, Jiwu Shu “Space-Efficient and High-Performance Inline Deduplication for Emerging Hybrid Storage System with Libra+” *Journal of Systems Architecture, JSA*, Apr 2024.
- [16] Tianmeng Zhang, Renhui Chen, Zijing Li, **Congming Gao\***, Chengke Wang, Jiwu Shu “Design and Implementation of Deduplication on F2FS” *ACM Transactions on Storage, TOS*, Mar 2024.

- [15] Linbo Long, Shuiyong He, Jingchen Shen, Renping Liu, Zhenhua Tan, **Congming Gao**, Duo Liu, Yi Jiang “WA-Zone: Wear-Aware Zone Management Optimization for LSM-Tree on ZNS SSDs” *ACM Transactions on Architecture and Code Optimization, TACO*, Dec 2023.
- [14] Linbo Long, Jinpeng Huang, **Congming Gao\***, Duo Liu, Renping Liu, Yi Jiang “ADAR: Application-specific Data Allocation and Reprogramming Optimization for 3D TLC Flash Memory” *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, TCAD*, Sep 2022.
- [13] Min Ye, Qiao Li, **Congming Gao**, Shun Deng, Tei Wei Kuo and Chun Jason Xue “Stop unnecessary refreshing: extending 3D NAND flash lifetime with ORBER” *CCF Transactions on High Performance Computing, THPC*, Apr 2022.
- [12] **Congming Gao**, Min Ye, Chun Jason Xue, Youtao Zhang, Liang Shi, Jiwu Shu and Jun Yang “Reprogramming 3D TLC Flash Memory based Solid State Drives” *ACM Transactions on Storage, TOS*, Jan 2022.
- [11] **Congming Gao**, Liang Shi, Kai Liu, Chun Jason Xue and Jiwu Shu “Architecture and Technologies of Flash Memory based Solid State Drives (in Chinese)” *Journal of Computer Research and Development*, Jul 2021.
- [10] **Congming Gao**, Liang Shi, Kai Liu, Chun Jason Xue, Jun Yang and Youtao Zhang “Boosting the Performance of SSDs via Fully Exploiting the Plane Level Parallelism” *IEEE Transactions on Parallel and Distributed Systems, TPDS*, Jun 2020.
- [9] **Congming Gao**, Liang Shi, Qiao Li, Kai Liu, Chun Jason Xue, Jun Yang and Youtao Zhang “Aging Capacitor Supported Cache Management Scheme for Solid State Drivers” *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, TCAD*, Nov 2019.
- [8] Chao Wu, Cheng Ji, Qiao Li, **Congming Gao**, Riwei Pan, Chenchen Fu, Liang Shi and Chun Jason Xue “Maximizing I/O Throughput and Minimizing Performance Variation via Reinforcement Learning based I/O Merging for SSDs” *IEEE Transactions on Computers, TC*, Aug 2019.
- [7] Qiao Li, Liang Shi, Yeji Di, **Congming Gao**, Cheng Ji, Yu Liang and Chun Jason Xue “Process Variation Aware Read Performance Improvement for LDPC-Based nand Flash Memory” *IEEE Transactions on Reliability, TR*, Feb 2019.
- [6] Yeji Di, Liang Shi, **Congming Gao**, Qiao Li, Chun Jason Xue and Kaijie Wu “Minimizing Retention Induced Refresh Through Exploiting Process Variation of Flash Memory” *IEEE Transactions on Computers, TC*, Jul 2018.
- [5] Qiao Li, Liang Shi, **Congming Gao**, Yeji Di, Chun Jason Xue “Access Characteristic Guided Read and Write Regulation on Flash based Storage Systems” *IEEE Transactions on Computers, TC*, May 2018.
- [4] Cheng Ji, Li-Pin Chang, Liang Shi, **Congming Gao**, Chao Wu, YuanGang Wang, Chun Jason Xue “Lightweight Data Compression for Mobile Flash Storage” *ACM Transactions on Embedded Computing Systems, TECS*, Oct 2017.
- [3] **Congming Gao**, Liang Shi, Yeji Di, Qiao Li, Chun Jason Xue, Kaijie Wu and Edwin H.-M. Sha “Exploiting Chip Idleness for Minimizing Garbage Collection Induced Chip Access Conflict on SSDs” *ACM Transactions on Design Automation of Electronic Systems, TODAES*, Aug 2017.
- [2] **Congming Gao**, Liang Shi, Cheng Ji, Yeji Di, Kaijie Wu, Chun Jason Xue and Edwin H.-M. Sha “Exploiting Parallelism for Access Conflict Minimization in Flash-based Solid State Drives” *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, TCAD*, Apr 2017.
- [1] Edwin H.-M. Sha, **Congming Gao**, Liang Shi, Kaijie Wu, Mengying Zhao and Chun Jason Xue “Asymmetric Error Rates of Cell States Exploration for Performance Improvement on Flash Memory based Storage Systems” *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, TCAD*, Oct 2016.

## AWARDS

- Xiaomi Young Talents Program 2026
- IEEE NVMSA Best Paper Award 2025
- The Tenth Young Elite Scientists Sponsorship Program by CAST 2024
- ACM SIGCSE China Rising Star Award 2024

- IEEE NVMSA Best Paper Award 2024
- Nanqiang Top-notch Young Talents Support Plan of Xiamen University (B-class) 2022
- Excellent Doctoral Dissertation Award of Chongqing 2021
- Excellent Doctoral Dissertation Award of Chongqing University 2021
- “Alibaba Cloud-CCF Storage Committee” Outstanding Paper Award 2020
- “Alibaba Cloud-CCF Storage Committee” Outstanding Paper Award 2019

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ACTIVITIES**

**Journal Reviewer:**

- ACM CSUR/TC/TOS/TPDS/TCAD/TKDE/TACO/TODAES

**Program Committee Member:**

- ASP-DAC’25/HPCC’24/NAS’24/ChinaSys’23/ICPADS’23

**Conference Organizer:**

- ChinaSys Spring’26 Storage Track Chair/ChinaSys Spring’25 Publicity Chair/NAS’24 Local Chair/ESWEEK-MSR’20 Website Chair