
Personal Information

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Education

Doctor of Philosophy Sep. 2017 – Jun. 2021

Department of Computer Science and Information Engineering, National Taiwan University

- GPA: 4.15/4.30
- Advisor: Prof. Tei-Wei Kuo
- Co-Advisor: Prof. Yuan-Hao Chang
- Field of Research: Memory/storage systems, emerging nonvolatile memory and storage technologies, next-generation memory/storage architecture designs, and neural networks
- Ph.D. Dissertation: Achieving High-performance Neural Networks on NVM-based System by Exploiting Approximate Computing

Master Sep. 2015 - Jun. 2017

Department of Computer Science and Information Engineering, National Taiwan University

- Advisor: Prof. Tei-Wei Kuo
- Co-Advisor: Prof. Yuan-Hao Chang
- Master Thesis: Scrubbing-aware Sanitization for 3D NAND Flash

Bachelor Sep. 2011 - Jun. 2015

Department of Computer Science and Information Engineering, National Taiwan University

- Advisor: Prof. Shou-De Lin
 - Field of Research: Machine learning and recommendation system
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Experiences

- **Massachusetts Institute of Technology:** **Postdoctoral Associate** Mar. 2023 – Present
Postdoctoral Fellow Mar. 2022 – Feb. 2023
 - Research topics: TinyML and efficient deep learning on edge devices
 - MCUNetV3: On-Device Training Under 256KB Memory
 - TinyEngine: A Memory-Efficient and High-Performance Neural Network Library for Microcontrollers
 - **Macronix International Co., Ltd.:** **Executive Engineer** Jul. 2021 – Feb. 2022
Principal Engineer Sep. 2019 – Jun. 2021
Senior Engineer Sep. 2017 – Aug. 2019
 - Research topics:
 - Memory/storage systems: e.g., controller of NAND flash, and data sanitization
 - Emerging nonvolatile memory and storage technologies: e.g., phase-change memory
 - Next-generation memory/storage architecture designs: e.g., in-memory computing
 - Neural network: e.g., convolutional neural networks, and recurrent neural networks
 - **Macronix International Co., Ltd.** Sep. 2015 - Jun. 2017
 - National Taiwan University-Macronix Academic-Industrial Cooperation
 - Research topics: Efficient and reliable data sanitization techniques on 3D NAND flash memory
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Publications

● Journal Papers

1. **Wei-Chen Wang**, Yuan-Hao Chang, Tei-Wei Kuo, Chien-Chung Ho, Yu-Ming Chang, and Hung-Sheng Chang, "Achieving Lossless Accuracy with Lossy Programming for Efficient Neural-Network Training on NVM-Based Systems," ACM Transactions on Embedded Computing Systems (TECS), vol. 18, Issue 5s, no. 68, pp. 68:1-68:22, Oct. 2019. (Integrated with ACM/IEEE CODES+ISSS'19)

2. **Wei-Chen Wang**, Chien-Chung Ho, Yuan-Hao Chang, Tei-Wei Kuo, and Ping-Hsien Lin, "Scrubbing-aware Secure Deletion for 3D NAND Flash," IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD), vol. 37, no. 11, pp. 2790-2801, Nov. 2018. (Integrated with ACM/IEEE CODES+ISSS'18)

● **Conference Papers**

1. Liang-Chi Chen, Shu-Qi Yu, Chien-Chung Ho, **Wei-Chen Wang**, and Yung-Chun Li, "Efficient Sanitization Design for LSM-based Key-Value Store over 3D MLC NAND Flash," accepted and to appear at ACM/SIGAPP Symposium on Applied Computing (SAC), Tallinn, Estonia, Mar. 27-31, 2023.
2. Ji Lin, Ligeng Zhu, Wei-Ming Chen, **Wei-Chen Wang**, Chuang Gan, and Song Han, "On-Device Training Under 256KB Memory," Conference on Neural Information Processing Systems (NeurIPS), New Orleans, Louisiana, USA, Nov. 27 – Dec. 4, 2022. **(Top Conference)**
3. Han-Wen Hu, **Wei-Chen Wang**, Yuan-Hao Chang, Yung-Chun Lee, Bo-Rong Lin, Huai-Mu Wang, Chong-Ying Lee, Yu-Ming Huang, Yen-Po Lin, Tzu-Hsiang Su, Chih-Chang Hsieh, Chia-Ming Hu, Yi-Ting Lai, Chung-Kuang Chen, Han-Sung Chen, Hsiang-Pang Li, Tei-Wei Kuo, Keh-Chung Wang, Meng-Fan Chang, Chun-Hsiung Hung, and Chih-Yuan Lu, "ICE: An Intelligent Cognition Engine with 3D NAND-based In-Memory Computing for Vector Similarity Search Acceleration," ACM/IEEE International Symposium on Microarchitecture (MICRO), Chicago, Illinois, USA, Oct. 1-5, 2022. **(Top Conference)**
4. Liang-Chi Chen, Shu-Qi Yu, Chien-Chung Ho, Yuan-Hao Chang, Da-Wei Chang, **Wei-Chen Wang**, and Yu-Ming Chang, "RNA-seq Quantification on Processing in memory Architecture: Observation and Characterization," IEEE Nonvolatile Memory Systems and Applications Symposium (NVMSA), Taipei, Taiwan, Aug. 23-25, 2022.
5. Chien-Chung Ho, **Wei-Chen Wang**, Szu-Yu Chen, Yung-Chun Li, and Kun-Chi Chiang, "RAM: Exploiting Restrained and Approximate Management for Enabling Neural Network Training on NVM-based Systems," The 37th ACM/SIGAPP Symposium on Applied Computing (SAC), Virtual Conference, Apr. 25-29, 2022.
6. Yu-Ming Chang, Chien-Chung Ho, Che-Wei Tsao, Shu-Hsien Liao, **Wei-Chen Wang**, Tei-Wei Kuo, and Yuan-Hao Chang, "On Enduring More Data Through Enabling Page Rewrite Capability on Multi-level-cell Flash Memory," The 37th ACM/SIGAPP Symposium on Applied Computing (SAC), Virtual Conference, Apr. 25-29, 2022.
7. Han-Wen Hu, **Wei-Chen Wang**, Chung-Kuang Chen, Yung-Chun Lee, Bo-Rong Lin, Huai-Mu Wang, Yen-Bo Lin, Yu-Chao Lin, Chih-Chang Hsieh, Chia-Ming Hu, Yi-Ting Lai, Yuan-Hao Chang, Hsiang-Pang Li, Han-Sung Chen, Tei-Wei Kuo, Keh-Chung Wang, Meng-Fan Chang, Chun-Hsiung Hung, and Chih-Yuan Lu, "A 512Gb In-Memory-Computing 3D NAND Flash Supporting Similar Vector Matching Operations on AI Edge Devices," IEEE International Solid-State Circuits Conference (ISSCC), San Francisco, California, USA, Feb. 20-24, 2022. **(Top Conference)**
8. Chien-Chung Ho, **Wei-Chen Wang**, Te-Hao Hsu, Zhi-Duan Jiang, and Yung-Chun Li, "Approximate Programming Design for Enhancing Energy, Endurance and Performance of Neural Network Training on NVM-based Systems," IEEE Nonvolatile Memory Systems and Applications Symposium (NVMSA), Virtual Conference, Aug. 18-19, 2021. **(Best Paper Award)**
9. Ting-Hsuan Lo, Chun-Feng Wu, Yuan-Hao Chang, Tei-Wei Kuo, and **Wei-Chen Wang**, "Space-efficient Graph Data Placement to Save Energy of ReRAM Crossbar," ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED), Virtual Conference, Jul. 26-28, 2021. **(Top Conference)**
10. **Wei-Chen Wang**, Chien-Chung Ho, Yu-Ming Chang, and Yuan-Hao Chang, "Challenges and Designs for Secure Deletion in Storage Systems," IEEE International Conference on Computing, Analytics and Networks (ICAN), Chiayi, Taiwan, Feb. 7-8, 2020.
11. **Wei-Chen Wang**, Ping-Hsien Lin, Yung-Chun Li, Chien-Chung Ho, Yu-Ming Chang, and Yuan-Hao Chang, "Toward Instantaneous Sanitization through Disturbance-induced Errors and Recycling Programming over 3D Flash Memory," ACM/IEEE International Conference on Computer-Aided Design (ICCAD), Westminster, Colorado, USA, Nov. 4-7, 2019. **(Top Conference)**
12. **Wei-Chen Wang**, Yuan-Hao Chang, Tei-Wei Kuo, Chien-Chung Ho, Yu-Ming Chang, and Hung-Sheng Chang, "Achieving Lossless Accuracy with Lossy Programming for Efficient Neural-Network Training on NVM-Based Systems," ACM/IEEE International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS), New York, New York, USA, Oct. 13-18, 2019. (Journal Track,

Integrated with ACM TECS) (**Best Paper Award - Top Conference**)

13. Ping-Hsien Lin, Yu-Ming Chang, Yung-Chun Li, **Wei-Chen Wang**, Chien-Chung Ho, and Yuan-Hao Chang, "Achieving Fast Sanitization with Zero Live Data Copy for MLC Flash Memory," ACM/IEEE International Conference on Computer-Aided Design (ICCAD), San Diego, California, USA, Nov. 5-8, 2018. (**Top Conference**)
14. **Wei-Chen Wang**, Chien-Chung Ho, Yuan-Hao Chang, Tei-Wei Kuo, and Ping-Hsien Lin, "Scrubbing-aware Secure Deletion for 3D NAND Flash," ACM/IEEE International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS), Torino, Italy, Sep. 30 - Oct. 5, 2018. (Journal Track, Integrated with IEEE TCAD) (**Top Conference**)
15. Chien-Chung Ho, Yung-Chun Li, Ping-Hsien Lin, **Wei-Chen Wang**, and Yuan-Hao Chang, "A Stride-away Programming Scheme to Resolve Crash Recoverability and Data Readability Issues of Multi-level-cell Flash Memory," IEEE Nonvolatile Memory Systems and Applications Symposium (NVMISA), Hakodate, Japan, Aug. 28-31, 2018.

Patents and Patent Applications

● U.S. Patents

1. **Wei-Chen Wang**, Hung-Sheng Chang, Chien-Chung Ho, Yuan-Hao Chang, and Tei-Wei Kuo, "Memory Device and Wear Leveling Method for the Same," Patent No.: US 11,550,709 B2; Issued Jan 10, 2023.
2. **Wei-Chen Wang**, Hung-Sheng Chang, Chien-Chung Ho, Yuan-Hao Chang, and Tei-Wei Kuo, "Memory Device for Neural Networks," Patent No.: US 11,526,285 B2; Issued Dec 13, 2022.
3. Yung-Chun Li, and **Wei-Chen Wang**, "Data Management Method for Memory and Memory Apparatus Using the Same," Patent No.: US 11,222,693 B2; Issued Jan 11, 2022.
4. Ping-Hsien Lin, **Wei-Chen Wang**, Hsiang-Pang Li, Shu-Hsien Liao, Che-Wei Tsao, Yuan-Hao Chang, and Tei-Wei Kuo, "Memory System, Method of Operating Memory, and Non-Transitory Computer Readable Storage Medium," Patent No.: US 11,194,515 B2; Issued Dec 7, 2021.
5. **Wei-Chen Wang**, Ping-Hsien Lin, Tse-Yuan Wang, Yuan-Hao Chang, and Tei-Wei Kuo, "Memory Management Apparatus and Memory Management Method," Patent No.: US 11,042,308 B2; Issued Jun 22, 2021.
6. **Wei-Chen Wang**, Ting-Hsuan Lo, Chun-Feng Wu, Yuan-Hao Chang, and Tei-Wei Kuo, "Memory Device and Operation Method Thereof," Patent Pub. No.: US 2022/0155959 A1; Published May 19, 2022.
7. **Wei-Chen Wang**, Chien-Chung Ho, Yuan-Hao Chang, and Tei-Wei Kuo, "In-Memory Computing Method and Apparatus," Patent Pub. No.: US 2021/0326114 A1; Published Oct 21, 2021.
8. **Wei-Chen Wang**, Shu-Yin Ho, Chien-Chung Ho, and Yuan-Hao Chang, "Operation Method for Artificial Neural Network," Patent Pub. No.: US 2021/0158160 A1; Published May 27, 2021.

● China Patents

1. Ping-Hsien Lin, **Wei-Chen Wang**, Chien-Chung Ho, Yuan-Hao Chang, Tei-Wei Kuo, and Yu-Ming Chang, "Memory Device and Data Management Method Applied Thereto," Patent No.: CN 109710173 B; Issued Dec 3, 2021.
2. Yung-Chun Li, and **Wei-Chen Wang**, "Memory Device," Patent Pub. No.: CN 113741799 A; Published Dec 3, 2021.
3. **Wei-Chen Wang**, Chien-Chung Ho, Yuan-Hao Chang, and Tei-Wei Kuo, "In-Memory Operation Method and Device," Patent Pub. No.: CN 113537453 A; Published Oct 22, 2021.
4. **Wei-Chen Wang**, Shu-Yin Ho, Chien-Chung Ho, and Yuan-Hao Chang, "Operation Method of Neural Network," Patent Pub. No.: CN 112948753 A; Published Jun 11, 2021.
5. Ping-Hsien Lin, **Wei-Chen Wang**, Hsiang-Pang Li, Shu-Hsien Liao, Che-Wei Tsao, Yuan-Hao Chang, and Tei-Wei Kuo, "Memory System and Memory Operation Method," Patent Pub. No.: CN 112506809 A; Published Mar 16, 2021.

● Taiwan Patents

1. **Wei-Chen Wang**, Yung-Chun Li, Shu-Yin Ho, and Chien-Chung Ho, "Memory Device and Memory Operation Method," Patent No.: TW I780967 B; Issued Oct 11, 2022.
2. **Wei-Chen Wang**, Shu-Yin Ho, Chien-Chung Ho, and Yuan-Hao Chang, "Operation Method for Artificial Neural Network," Patent No.: TW I770668 B; Issued Jul 11, 2022.

3. Yung-Chun Li, and **Wei-Chen Wang**, "Memory Apparatus," Patent No.: TW I747532 B; Issued Nov 21, 2021.
4. Ping-Hsien Lin, **Wei-Chen Wang**, Hsiang-Pang Li, Shu-Hsien Liao, Che-Wei Tsao, Yuan-Hao Chang, and Tei-Wei Kuo, "Memory System and Method of Operating Memory," Patent No.: TW I694449 B; Issued May 21, 2020.
5. Ping-Hsien Lin, **Wei-Chen Wang**, Chien-Chung Ho, Yuan-Hao Chang, Tei-Wei Kuo, and Yu-Ming Chang, "Memory Device and Data Management Method Thereof," Patent No.: TW I629592 B; Issued Jul 11, 2018.
6. **Wei-Chen Wang**, Chien-Chung Ho, and Yuan-Hao Chang, "Neural Network System and Memory Operation Method," Patent Pub. No.: TW 202230220 A; Published Aug 1, 2022.
7. **Wei-Chen Wang**, Chien-Chung Ho, Yuan-Hao Chang, and Tei-Wei Kuo, "In-Memory Computing Method and In-Memory Computing Apparatus," Patent Pub. No.: TW 202141305 A; Published Nov 1, 2021.

Honors and Awards

● 1st Place (in 150 Teams) in the Memory Size Track of ACM/IEEE TinyML Design Contest	Nov. 2022
● 3rd Place (in 150 Teams) in the Overall Track of ACM/IEEE TinyML Design Contest	Nov. 2022
● Postdoctoral Research Abroad Fellowship sponsored by Taiwan National Science and Technology Council (NSTC)	Mar. 2022
● Outstanding Ph.D. Dissertation Award of Institute of Information and Computing Machinery (IICM)	Mar. 2022
● Best Ph.D. Dissertation Award of Taiwan Information Storage Association (TISA)	Oct. 2021
● Best Paper Award of IEEE NVMSA	Jul. 2021
● Taiwan Ministry of the Interior Award for Research and Development Alternative Service	Jun. 2021
● NTUEE-1975 Innovation and Entrepreneurship Fund Award	Feb. 2021
● Graduate Students Study Abroad Fellowship elected by Taiwan National Science and Technology Council (NSTC)	Dec. 2020
● Outstanding Research Performance Scholarship of CTCI Foundation	Nov. 2020
● Student Outstanding Performance Award of National Taiwan University (NTU)	Nov. 2020
● Best Master Thesis Award of Taiwan Information Storage Association (TISA)	Nov. 2020
● Taiwan Semiconductor Industry Association (TSIA) Award	Jul. 2020
● Scholarship of Pan Wen Yuan Foundation	Nov. 2019
● Best Paper Award of ACM/IEEE CODES+ISSS	Oct. 2019
● Student Travel Grant Award of Embedded Systems Week (ESWEEK)	Oct. 2019
● Fourth Prize (in 821 teams) of ACM KDD Cup	May. 2015

Projects

● MCUNetV3: On-Device Training Under 256KB Memory Massachusetts Institute of Technology, PI: Prof. Song Han	Mar. 2022 – Present
● TinyEngine: A Memory-Efficient and High-Performance Neural Network Library for Microcontrollers Massachusetts Institute of Technology, PI: Prof. Song Han	Mar. 2022 – Present
● The Study on Graph and Neural Network Designs and Optimizations with Non-volatile Memories <i>National Taiwan University-Macronix Academic-Industrial Cooperation Project</i> PI: Prof. Tei-Wei Kuo, Prof. Chia-Ling Yang, Prof. Yuan-Hao Chang, and Dr. Keh-Chung Wang	Jan. 2020 – Feb. 2022
● Design and Optimization for Neural Networks with Non-volatile Memories <i>National Taiwan University-Macronix Academic-Industrial Cooperation Project</i> PI: Prof. Tei-Wei Kuo, Prof. Chia-Ling Yang, Prof. Yuan-Hao Chang, and Dr. Keh-Chung Wang	Jan. 2018 – Dec. 2019
● The Study on Virtualized Storage Erasing and Integrated Main-Memory-and-Storage Usages of Non-Volatile Memory <i>National Taiwan University-Macronix Academic-Industrial Cooperation Project</i> PI: Prof. Tei-Wei Kuo, Prof. Chia-Ling Yang, Prof. Yuan-Hao Chang, and Dr. Keh-Chung Wang	Jan. 2016 – Dec. 2017
● The Designs of Systems and Interfaces of Non-Volatile Memory in	Sep. 2015 – Dec. 2015

Integrated Main-Memory-and-Storage Usages

National Taiwan University-Macronix Academic-Industrial Cooperation Project

PI: Prof. Tei-Wei Kuo, Prof. Chia-Ling Yang, Prof. Yuan-Hao Chang, and Dr. Keh-Chung Wang

Academic Services

TPC/PC Member

- Program Committee Member, ACM/SIGAPP Symposium on Applied Computing (SAC), 2023.
- Program Committee Member, ACM/SIGAPP Symposium on Applied Computing (SAC), 2022.

Journal Reviewer

- IEEE Transactions on Emerging Topics in Computing (TETC)
- IEEE Transactions on Computers (TC)
- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)
- ACM Transactions on Storage (TOS)
- IEEE Transactions on Very Large Scale Integration Systems (TVLSI)

Conference Reviewer

- Conference on Machine Learning and Systems (MLSys), 2023.
 - IEEE International Symposium on High-Performance Computer Architecture (HPCA), 2022.
 - ACM/IEEE Design Automation Conference (DAC), 2022, 2021 and 2020.
 - ACM/IEEE International Conference on Computer-Aided Design (ICCAD), 2022.
 - IEEE Real-Time Systems Symposium (RTSS), 2021 and 2019.
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2021.
 - ACM/IEEE Asia and South Pacific Design Automation Conference (ASP-DAC), 2021 and 2019.
 - ACM/IEEE International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS), 2020.
 - IEEE International Conference on Multimedia Big Data (BigMM), 2019.
 - International Workshop on Next-Generation Operating Systems for Cyber-Physical Systems (NGOSCPS), 2019.
 - ACM Research in Adaptive and Convergent Systems (RACS), 2018.
 - IEEE Non-Volatile Memory Systems and Applications Symposium (NVMSA), 2018.
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Language Proficiency

Mandarin Chinese: Native speaker

English Certification

- **General English Proficiency Test (GEPT):** High-Intermediate Level
- **Foreign Language Proficiency Test (FLPT) - English:** Reading & Listening: 294, Writing: B, Speaking: S-2+

Japanese Certification

- **Japanese-Language Proficiency Test (JLPT):** N5
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Short Biography

Wei-Chen Wang is currently a Postdoctoral Associate at the Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT). He received his Ph.D. degree in Computer Science and Information Engineering from National Taiwan University, Taipei, Taiwan, in June 2021. Previously, he received his B.S. and M.S. degrees in Computer Science and Information Engineering from National Taiwan University in 2015 and 2017, respectively. Before joining MIT in 2022, he served as an Executive Engineer at Emerging System Laboratory, Macronix International Co., Ltd., which is the largest NOR flash memory manufacturer in the world.

His research interests include efficient deep learning, TinyML, embedded systems, operating systems, and memory/storage systems. He has published 17 research papers, which were mainly published in top journals (including premier ACM/IEEE Transactions, e.g., IEEE TCAD, and ACM TECS) and top conferences (including NeurIPS, IEEE ISSCC, ACM/IEEE MICRO, ACM/IEEE ICCAD, ACM/IEEE ISLPED, and ACM/IEEE CODES+ISSS). Besides, he was the recipient of the 2019 ACM/IEEE CODES+ISSS Best Paper Award and the 2021 IEEE NVMSA Best Paper Award. He has also published 20 US, China, and Taiwan patents, 11 of which have been granted. He is a Member of IEEE and a Member of ACM.