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Education

2021 – Now **Ph.D. ECE, Hong Kong University of Science and Technology (HKUST)**
Thesis Topic: *Ultra-Low-Power AI Chips and Systems.*
Supervisors: *Prof. Kwang-Ting Tim Cheng (Fellow of Hong Kong Academy of Engineering Sciences, IEEE Fellow, Vice President of HKUST, Chair Professor of ECE & CSE, Director of ACCESS) and Prof. Chi-Ying Tsui (IEEE Senior Member, Full Professor of ISD & ECE, Director of Entrepreneurship Education, Founding Head of ISD Division, Associate Director of ACCESS, Associate Director of CSSET)*

2020 – 2021 **Visiting Student, Westlake University**
Research Topic: *Intelligent Biomedical Chips and Systems.*
Supervisors: *Prof. Mohamad Sawan (Fellow of the Royal Society of Sciences of Canada, Fellow of the Canadian Academy of Engineering, Fellow of the Canadian Institute of Engineering, IEEE Fellow, Chair Professor of SoE).*

2019 – 2019 **Visiting Student, University of Oxford**
Research Topic: *AI-based Motion Planning for Mobile robotics.*

2017 – 2021 **B.Eng. Microelectronics, Fudan University**
Supervisors: *Prof. Xiaoyong Xue (IEEE Member, Full Professor of Microelectronics) and Prof. Wei Chen (IEEE Senior Member, Head of School of Biomedical Engineering and Full Professor at the University of Sydney).*

Awards

International Academic Awards

2025 **IEEE ASSCC SDC Certificate**
2024 **IEEE Circuit and System Society Pre-Doctoral Travel Grant**
2023 **IEEE AICAS Best Paper Award (First Place)**
IEEE Circuit and System Society STG Award
2022 **IEEE ISCAS Student Participation Award**

Regional Awards

2024 **ECE Future Leaders**. Awarded by HKUST.
Third Prize, Yangtze-River-Delta Engineering Student Talk. Awarded by Westlake University.
2021 **Postgraduate Studentship**. Awarded by HKUST.
Edwards Scholarship. Awarded by Fudan University.
2020 **Lady Margaret Hall Research Presentation Award**. Awarded by Oxford University.

Awards (continued)

- **Third Prize & Audiance Appreciation Award & Top6, China-US Young Maker Competition, Shanghai**. Awarded by the Ministry of Education, China.
- **Google Innovation Program Funding**. Awarded by the Ministry of Education, China.
- **Teng-Fei Research Excellence Award**. Awarded by Fudan University.
- **Outstanding Undergraduate Scholarship**. Awarded by Fudan University.

2019
- **FDUROP Research Funding**. Awarded by Fudan University.
- **Outstanding Undergraduate Scholarship**. Awarded by Fudan University.

2018
- **Third Prize, Mathematics Competition of Chinese College Students**. Awarded by Chinese Mathematical Society (CMS).
- **Third Prize, FDU "Internet +" Innovation and Entrepreneurship Competition**. Awarded by Fudan University.
- **Outstanding Undergraduate Scholarship**. Awarded by Fudan University.

Invited Talks

2024
- **Ultra-Low-Power AIoT for Edge Healthcare with Software-Hardware Co-Design**, IEEE Circuits and Systems Society Ph.D Forum, Singapore

2023
- **Scalable and Efficient SRAM-based Computing-in-Memory Technology for AIoT**, Westlake Future Scholars Forum on Engineering, Hangzhou
- **Ultra-efficient Neural Processing System with Computing-in-Memory Technology for Wearable Healthcare**, ACCESS Seminar Series, Hong Kong

Research Experience

2021 – Now
- **AI Chip Center for Emerging Smart Systems (ACCESS), InnoHK & HKUST**
  Research Project 1: *Neuromorphic System-on-Chip Design and Implementation from Software to Hardware (7 chip tape-outs up to now).*
  Research Project 2: *Computing-in-Memory Chip Design with Emerging Technologies (2 chip tape-outs up to now).*

2020 – 2021
- **Centre of Excellence in Biomedical Research of Advanced Integrated-on-chips Neurotechnology (CenBRAIN Neurotech), Westlake University**
  Research Project: *Sensory computing chipsets for emerging biomedical applications (3 chip tape-outs).*

2018 – 2020
- **Processor Design and System Institute, Fudan University**
  Research Project: *Neural circuit and neural system design using ReRAM (1 chip tape-out)..*

Teaching

ELEC5160
- **Digital VLSI System Design and Design Automation**, Graduate Teaching Assistant

ELEC4410
- **CMOS VLSI Design**, Graduate Teaching Assistant

ELEC3400
- **Introduction to Integrated Circuits and Systems**, Graduate Teaching Assistant

ELEC2400
- **Electronic Circuits**, Graduate Teaching Assistant

Research Publications

* indicates co-first authorship # indicates corresponding authorship

1. H. Wu*, **F. Tian***, J. Chen, *et al.*, "A 0.00022mm2/electrode 1024-channel sparsity-aware neural interface with cim-based predictive focused sampling for hotspot spike tracking," *accepted to 2026 IEEE International Solid-State Circuits Conference (ISSCC)*, 2026.

2. P. Dong*, ..., **F. Tian**, C.-Y. Tsui, F. Tu, and K.-T. Cheng, "A 28nm 0.22 μj/token memory-compute-intensity-aware cnn-transformer accelerator with hybrid-attention-based layer-fusion and cascaded pruning for semantic-segmentation," in *2025 IEEE International Solid-State Circuits Conference (ISSCC)*, IEEE, 2025, pp. 1–3.

3. C. Fang, Z. Shen, ..., **F. Tian**, J. Yang, and M. Sawan, "A 28nm spiking vision transformer accelerator with dual-path sparse compute core and ema-free self-attention engine for embodied intelligence," *accepted to IEEE Transactions on Circuits and Systems for Artificial Intelligence*, 2025.

4. C. Fang, Z. Shen, **F. Tian**, J. Yang, and M. Sawan, "An area-efficient and bit-width configurable carry-save adder tree for spiking transformers," in *2025 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2025, pp. 1–5.

5. K. Shao*, **F. Tian***#, X. Wang, *et al.*, "Syndcim: A performance-aware digital computing-in-memory compiler with multi-spec-oriented subcircuit synthesis," in *2025 Design, Automation & Test in Europe Conference (DATE)*, IEEE, 2025, pp. 1–7.

6. **F. Tian**, K. Shao, J. Zheng, *et al.*, "Lemem: A 179.8tflops/w, 24.21tflops learning-in-memory processor with layer-fused forward/backward pipeline for edge dnn/snn training/inference," *accepted to 2025 IEEE Asian Conference on Solid-State Circuits (ASSCC)*, 2025.

7. **F. Tian***#, J. Chen*, K. Shao*, *et al.*, "E-npu: A 34˜126nj/class event-driven adaptive neural soc with signal-dynamics-aware feature clustering and multi-model in-memory inference/training for personalized medical wearables," in *2025 IEEE Custom Integrated Circuits Conference (CICC)*, IEEE, 2025, pp. 1–3.

8. Y. Yao, S. Sarkar, **F. Tian**, W.-H. Ki, C.-Y. Tsui, and Y. Liu, "Analysis and prevention of coupling-dependent data flipping in series-series resonant wireless power transfer systems," in *2025 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2025, pp. 1–4.

9. Y. Yao, **F. Tian**, J. He, *et al.*, "A 6.78 mhz multiple-transmitter wireless power transfer system with integrated coupling coefficient sensor," in *2025 Symposium on VLSI Technology and Circuits (VLSI Technology and Circuits)*, IEEE, 2025, pp. 1–3.

10. L. Zhao, K. Shao, **F. Tian**, T. K.-T. Cheng, C.-Y. Tsui, and Y. Zou, "A flexible precision scaling deep neural network accelerator with efficient weight combination," in *2025 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2025, pp. 1–5.

11. S. Zhao, S. Li, D. Wu, **F. Tian**, J. Yang, and M. Sawan, "A resource-efficient algorithm-hardware co-design towards semi-supervised neurological symptoms prediction," *IEEE Transactions on Instrumentation and Measurement*, 2025.

12. S. Zhao#, ..., **F. Tian**#, *et al.*, "Boostvit: Booth-serial skipping and tunable scaling for vision transformers," *IEEE Transactions on Circuits and Systems I: Regular Papers*, 2025.

13. J. Zheng*, **F. Tian***#, J. Chen, *et al.*, "Neuroeye: A 54.59 mw, 12200fps event-driven near-sensor eye-tracking processor with pipelined spatial-temporal spike-streaming," in *2025 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2025, pp. 1–5.

14. J. Chen, H. Wu, **F. Tian**, *et al.*, "A low-power level-crossing analog-to-spike converter intended for neuromorphic biomedical applications," in *2024 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2024, pp. 1–5.

15 J. Chen*, ..., **F. Tian**, W. Zou, J. Yang, and M. Sawan, "A neuron-inspired 0.0032 mm 2- 1.38 μw/ch wireless implantable neural interface with direct multiplexing front-end and event-driven spike detection and transmission," in *2024 IEEE Custom Integrated Circuits Conference (CICC)*, IEEE, 2024, pp. 1–2.

16 C. Fang, ..., **F. Tian**, J. Yang, and M. Sawan, "A 0.078 pj/sop unstructured sparsity-aware spiking attention/convolution processor with 3d compute array," in *2024 IEEE Custom Integrated Circuits Conference (CICC)*, IEEE, 2024, pp. 1–2.

17 C. Fang, Z. Shen, ..., **F. Tian**, J. Yang, and M. Sawan, "An energy-efficient unstructured sparsity-aware deep snn accelerator with 3-d computation array," *IEEE Journal of Solid-State Circuits*, 2024.

18 C. Fang, **F. Tian**, J. Yang, and M. Sawan, "Accelerating bptt-based snn training with sparsity-aware and pipelined architecture," in *2024 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2024, pp. 1–5.

19 X. Li, ..., **F. Tian**, W. Zhang, *et al.*, "Photonntt: Energy-efficient parallel photonic number theoretic transform accelerator," in *2024 Design, Automation & Test in Europe Conference & Exhibition (DATE)*, IEEE, 2024, pp. 1–6.

20 Z. Shen, ..., **F. Tian**, S. Ma, J. Yang, and M. Sawan, "Neurosort: A neuromorphic accelerator for spike-based online and real-time tracking," in *2024 IEEE International Conference on AI Circuits and Systems (AICAS)*, IEEE, 2024, pp. 312–316.

21 **F. Tian**, J. Zheng, J. He, *et al.*, "Bols: A bionic sensor-direct on-chip learning system with direct-feedback-through-time for personalized wearable health monitoring," in *2024 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2024, pp. 1–5.

22 **F. Tian***, J. Chen*, J. Zheng, *et al.*, "Biopi: An energy efficient and low-latency neuromorphic pipelined system with joint design optimizations of sensor-algorithm-processor for wearable healthcare," *IEEE Transactions on Circuits and Systems for Artificial Intelligence*, 2024.

23 X. Wang*, J. He*, ..., **F. Tian**, T. K.-T. Cheng, and C.-Y. Tsui, "Rescim: Variation-resilient high weight-loading bandwidth in-memory computation based on fine-grained hybrid integration of multi-level reram and sram cells," in *Proceedings of the 43rd IEEE/ACM International Conference on Computer-Aided Design*, 2024, pp. 1–9.

24 S. Zhao, C. Wang, C. Fang, **F. Tian**, J. Yang, and M. Sawan, "Hybmed: A hybrid neural network training processor with multi-sparsity exploitation for internet of medical things," *IEEE Transactions on Biomedical Circuits and Systems*, vol. 18, no. 5, pp. 1178–1189, 2024.

25 J. Chen, ..., **F. Tian**, X. Huo, C.-Y. Tsui, and K.-T. Cheng, "Autodcim: An automated digital cim compiler," in *2023 60th ACM/IEEE Design Automation Conference (DAC)*, IEEE, 2023, pp. 1–6.

26 J. Chen, ..., **F. Tian**, *et al.*, "A clockless robust bionic spike detector for implantable brain-computer interfaces," in *2023 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, IEEE, 2023, pp. 1–5.

27 J. Chen, ..., **F. Tian**, *et al.*, "Neurobmi: A new neuromorphic implantable wireless brain machine interface with a 0.48 μw event-driven noise-tolerant spike detector," in *2023 IEEE 5th International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, IEEE, 2023, pp. 1–5.

28 X. Chen, R. Pan, X. Wang, **F. Tian**, and C.-Y. Tsui, "Late breaking results: Weight decay is all you need for neural network sparsification," in *2023 60th ACM/IEEE Design Automation Conference (DAC)*, IEEE, 2023, pp. 1–2.

29 C. Fang, C. Wang, S. Zhao, **F. Tian**, J. Yang, and M. Sawan, "A 510uw 0.738mm2 6.2pj/sop online learning multi-topology snn processor with unified computation engine in 40-nm cmos," *IEEE Transactions on Biomedical Circuits and Systems*, vol. 17, no. 3, pp. 507–520, 2023.

30 J. He, Z. Shen, **F. Tian**, *et al.*, "Snnopt: An application-specific design framework for spiking neural networks," in *2023 IEEE 5th International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, IEEE, 2023.

31 J. Jiang, ..., **F. Tian**, *et al.*, "Tempo-cim: A rram compute-in-memory neuromorphic accelerator with area-efficient lif neuron and split-train-merged-inference algorithm for edge ai applications," *IEEE Journal on Emerging and Selected Topics in Circuits and Systems*, vol. 13, no. 4, pp. 986–999, 2023.

32 H. Li, A. H. Lone, **F. Tian**, J. Yang, M. Sawan, and N. El-Atab, "Novel knowledge distillation to improve training accuracy of spin-based snn," in *2023 IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, 2023, pp. 1–5.

33 H. Li, **F. Tian**, J. Yang, M. Sawan, and N. El-Atab, "Nmbnn: Noise-adaptive memristive bayesian neural network for energy-efficient edge health care," in *2023 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, IEEE, 2023, pp. 1–5.

34 Z. Shen, C. Fang, **F. Tian**, J. Yang, and M. Sawan, "Pn-tms: Pruned node-fusion tree-based multicast scheme for efficient neuromorphic systems," in *2023 IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, IEEE, 2023, pp. 1–5.

35 Z. Shen, **F. Tian**, J. Jiang, *et al.*, "Nbssn: A neuromorphic binary single-spike neural network for efficient edge intelligence," in *2023 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2023, pp. 1–5.

36 **F. Tian**, X. Wang, J. Chen, *et al.*, "Binary is all you need: Ultra-efficient arrhythmia detection with a binary-only compressive system," in *2023 IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS), First Place Best Paper Award*, 2023, pp. 1–5.

37 **F. Tian**, X. Wang, J. Chen, *et al.*, "Bios: A 40nm bionic sensor-defined 0.47 pj/sop, 268.7 tsops/w configurable spiking neuron-in-memory processor for wearable healthcare," in *ESSCIRC 2023-IEEE 49th European Solid State Circuits Conference (ESSCIRC)*, IEEE, 2023, pp. 225–228.

38 **F. Tian**, J. Yang, S. Zhao, and M. Sawan, "Neurocare: A generic neuromorphic edge computing framework for healthcare applications," *Frontiers in Neuroscience*, vol. 17, p. 1 093 865, 2023.

39 **F. Tian**, S. Zhao, J. He, *et al.*, "Nols: A near-sensor on-chip learning system with direct feedback alignment for personalized wearable heart health monitoring," in *2023 IEEE Biomedical Circuits and Systems Conference (BioCAS)*, IEEE, 2023, pp. 1–5.

40 J. Chen*, **F. Tian***, J. Yang, and M. Sawan, "An event-driven compressive neuromorphic system for cardiac arrhythmia detection," in *2022 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2022, pp. 2690–2694.

41 C. Fang, Z. Shen, **F. Tian**, J. Yang, and M. Sawan, "A compact online-learning spiking neuromorphic biosignal processor," in *2022 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2022, pp. 2147–2151.

42 C. Fang, **F. Tian**, C. Wang, J. Yang, and M. Sawan, "A 217.8 msops/w fpga-based online learning snn processor using unified event-driven structure and topology aware data reuse strategies," in *2022 IEEE Asian Solid-State Circuits Conference (A-SSCC)*, IEEE, 2022, pp. 1–3.

43 H. Li, ..., **F. Tian**, J. Yang, and M. Sawan, "Real-time biosignal recording and machine-learning analysis system," in *2022 IEEE 4th International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, IEEE, 2022, pp. 427–430.

44 **F. Tian***, J. Jiang*, J. Liang, *et al.*, "Nimble: A neuromorphic learning scheme and memristor based computing-in-memory engine for emg based hand gesture recognition," in *2022 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2022, pp. 2695–2699.

45 X. Wang, ..., **F. Tian**, and C. Tsui, "Tac-ram: A 65nm 4kb sram computing-in-memory design with 57.55 tops/w supporting multibit matrix-vector multiplication for binarized neural network," in *2022 IEEE 4th International Conference on Artificial Intelligence Circuits and Systems (AICAS)*, IEEE, 2022, pp. 66–69.

46 J. Jiang*, **F. Tian***, J. Liang, *et al.*, "Mspan: A memristive spike-based computing engine with adaptive neuron for edge arrhythmia detection," *Frontiers in Neuroscience*, vol. 15, p. 761 127, 2021.

47 **F. Tian**, J. Yang, S. Zhao, and M. Sawan, "A new neuromorphic computing approach for epileptic seizure prediction," in *2021 IEEE International Symposium on Circuits and Systems (ISCAS)*, IEEE, 2021, pp. 1–5.

Academic Service

Journal Reviewer

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- **Journal of Solid-State Circuits (JSSC)**
- **Transactions on Circuits and Systems I: Regular Papers (TCAS-I)**
- **Transactions on Circuits and Systems II: Express Brief (TCAS-II)**
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- **Transactions on Circuits and Systems for Video Technology (TCSVT)**
- **Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)**
- **Journal on Emerging and Selected Topics in Circuits and Systems (JETCAS)**
- **Journal of Biomedical and Health Informatics (JBHI)**

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- **npj Unconventional Computing**
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- **International Symposium on Circuits and Systems (ISCAS)** 2022–2026
- **International Conference on Artificial Intelligence Circuits and Systems (AICAS)** 2023

References

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