

Mufeng Chen

Email : chenmufeng@zju.edu.cn

Interests: Compute-In-Memory(CIM), Neuromorphic-Computing, Resistive-RAM

EDUCATION

Zhejiang University

Hangzhou, China

- Master of Engineering in Electronic Engineering

Sept. 2021 - Present

- GPA: 3.93/4.00

Huazhong University of Science and Technology

Wuhan, China

- Bachelor of Engineering in Optical&Electronic Engineering

Sept. 2017 - Jul. 2021

- GPA: 3.92/4.00

WORKING EXPERIENCE

RFNE research center, Zhejiang University

Hangzhou, China

- Master student, Electromagnetic research and SNN-CIM design

Jun. 2021 - Present

Purdue University

USA

- Research Assistant, Monolithic 3d-RRAM CIM; Hyperdimensional Computing

April. 2023 - Oct. 2023

Rice University

USA

- Research Assistant, charge-domain CIM

Feb. 2022 - Oct. 2022

Wuhan National Laboratory for Optoelectronics

Wuhan, China

- Research Assistant, Optical metasurface design

Aug. 2020 - Feb. 2021

PUBLICATIONS

- Y C, Du Y, **Chen M**, et al. *MAP-SNN: Mapping spike activities with multiplicity, adaptability, and plasticity into bio-plausible spiking neural networks*. Frontiers in Neuroscience.2022

Hanzhi Ma, **Chen M**, et al. *A Review on Electronic Design Automation for Electromagnetic Interference and Signal Integrity of Artificial Intelligence Neuromorphic Chips*. Electromagnetic Science.2024

PREPRINTS AND OTHER RESEARCH PROJECTS

- **Mufeng Chen**,Erping Li. *Spiking Mixers for Robust and Energy-efficient Vision-and-Language Learning*. 2023.(under review for ICLR 2024)

Mufeng Chen,Haitong Li. *Neuro-Vector-Symbolic Vision Transformer for Few Shot Classification and Generation*. 2023.(to be submitted to DAC-24)

Mufeng Chen,Zhanxi Pang, et.al. *RRAM-eDRAM hybrid CiM for event and frame-based video applications*(to be taped out)

RESEARCH EXPERIENCES

Reconfigurable Neuromorphic RRAM-CIM for Spiking/non-spiking Transformer workload

Advisor: Prof. Aili Wang, Prof. Liang Zhao, Prof. Erping Li

Nov. 2022 - Present

- A reconfigurable hybrid-CiM is developed for video applications.
 - A bitline-sharing eDRAM-RRAM hybrid CiM is developed aimed to provide better throughput characteristic against the inherent variation of RRAM cell while taking advantage of the small footprint of RRAM storage and zero-leakage characteristic.
 - The bitline is reconfigurable to support 1.to differential amplifier/transmission gate for diff-frame operation and denoising.2.to ADC for DNN computations.

Neuro-Vector-Symbolic Vision Transformer for Few Shot Classification and Generation

Advisor: Haitong Li

April. 2023 - Present

- Hyperdimensional Computing for Vision Transformer is carefully developed. HD part can bring on-chip learning capability while the backbone can extend HD to generation settings.
 - A ladder-side HD computation part is added to the traditional transformer backbone to add few-shot learning capability to transformers.
 - Use the characteristic of HRR-based VSA models to retrieve input data in a generative fashion and avoid the computation cost of traditional method of reading out prototypes in distributed memory system.
 - Working on the trade-off between 2D, 2.5D and 3D system for the acceleration of the above model featuring separate FFN core, attention core and HD core.

Multimodal Spiking-Mixer with robustness-improved ODE-neuron

Advisor: Prof. Erping Li

June. 2023 - Oct. 2023

- Propose the first Vision-Language multi-modal Spiking Neural Network for Image-Caption application
- Demonstrate to view SNN as Neural-ODE and by analyzing the stability of the ODE to gain adversarial robustness
- Extend multimodal Vision-Language adversarial attack to SNN domain and demonstrate the effectiveness compared to naive unimodal implementation

Charge-domain CIM for Bayesian Neural Network

Advisor: Prof. Kaiyuan Yang

Feb. 2022 - Aug. 2022

- Built a variable bit precision Neural Network Quantization method based on variational inference targeting flops reduction
- Constructed a charge-domain SRAM-CIM for uncertainty-aware CNN Quantized by the above algorithm
- Suppose to gain great energy reduction with charge reuse and unstructured sparsity routing/zero skipping based on workload characteristic

MAP: A new SNN training method

Advisor: Prof. Yang Du, Prof. Aili Wang, Prof. Erping Li

Nov. 2021 - Feb. 2022

- Proposed an algorithm investigating the discretization problem in time-iteration and demonstrated the robustness of our algorithm under varying iterative step lengths.
- Proposed an SFA mode as an MSP implementation for efficient spike inference and robustness under this mode.
- Enhanced temporal expressiveness with a State-Free Synaptic Response Model (SFSRM) and is compatible with deep learning frameworks.

Polarization—sensitive achromatic metalenses

Advisor: Prof. Chen Lin

Aug. 2019 - Jun. 2020

- Designed and developed the FDTD script code of the layout of the monochromatic metalenses.
- Theoretically analyzed the principle of achromatic metalenses and swept the parameters.
- Optimized the metalens and compared it with the monochromatic ones and conducted a report about it.
- The focus of lens remained unchanged when the input is 300nm-700nm.

AWARDS AND HONORS

Outstanding Dissertation for Bachelor's Degree, <i>HUST</i>	Jun. 2021
People's scholarship of HUST., <i>HUST</i>	Jun. 2018

CODING

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- **Primary Languages:** C, C++, Python, Matlab
 - **Others:** Verilog, Chisel