

Zhenhua Zhu

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EDUCATION

Department of Electronic Engineering, Tsinghua University

Aug. 2014 – Jul. 2018

Pursing B.S. in Electronic Engineering, Overall GPA: 89.09/100.00, Major GPA: 89.96/100.00

Grade Ranking: 42/245

Pass the CET4 and CET6, and have a good command of English in communication and research.

RESEARCH EXPERIENCES

A Deep Learning Chip Based on RRAM

Oct. 2016 - Present

Advisor: Yu Wang, associate professor in Department of EE, Tsinghua University

- Took part in developing a deep learning chip based on RRAM cooperate with NTHU, which breaks the memory wall bottleneck and supports the acceleration of deep learning algorithms (CNN and DNN) in different kernel sizes and strides with high energy efficiency. (*tape-out in Nov. 2016*)
- Developed the accelerator's peripheral circuit (work mode I/O circuit, test mode I/O circuit and feedback circuit) design, wrote most of the Verilog code of peripheral circuit and completed the simulation of the chip by ModelSim.

A Training-in-Memory Architecture

Nov. 2016 - Feb.2017

Advisor: Yu Wang, associate professor in Department of EE, Tsinghua University

- Proposed a training in memory architecture, TIME, in order to realize the training of neural network with high energy efficiency.
- Designed the peripheral circuits of the architecture. Proposed a RRAM writing scheme and gradual-write circuit to reduce the cost of writing RRAM.
- TIME can achieve 11.03x higher energy efficiency compared with ASIC in supervised learning and boost the energy efficiency to 107x higher than GPU in deep reinforcement learning.

GAME: GPU Acceleration of Metagenomics Clustering

Jun. 2017 – Aug.2017

Advisor: Yuan Xie, Professor in Department of ECE, University of California, Santa Barbara

- Designed a GPU based accelerator for Metagenomics clustering algorithm, which can achieve 93x speedup compared with CPU.

Mixed Size Crossbar based RRAM CNN Accelerator with Overlapped Mapping Method

Oct. 2017 – Apr. 2018

Advisor: Yu Wang, associate professor in Department of EE, Tsinghua University

- Propose an Overlapped Mapping Method (OMM) and Mixed Size Crossbar based RRAM CNN Accelerator (MISCA) to improve the utilization rate of crossbars and computing energy efficiency.
- The simulation results show that MISCA with OMM can achieve 2.7× speedup, 30% utilization rate improvement, and 1.2× energy efficiency on average compared with fixed size crossbars based accelerator using the conventional mapping method.

PUBLICATION

[1] Ming Cheng, Lixue Xia, **Zhenhua Zhu**, Yi Cai, Xiaoming Chen, Yu Wang, Huazhong Yang, Yuan Xie, TIME:A Training-in-memory Architecture for Memristor-based Deep Neural Network , to appear in DAC, 2017.

[2] Yi Cai, Tianqi Tang, Lixue Xia, Ming Cheng, **Zhenhua Zhu**, Yu Wang, Huazhong Yang, Training Low Bitwidth Convolutional Neural Networks on RRAM , in Proceedings of the 23rd ASP-DAC, 2018, pp.117-122.

[3] Jilan Lin, Lixue Xia, **Zhenhua Zhu**, Hanbo Sun, Yi Cai, Hui Gao, Ming Cheng, Xiaoming Chen, Yu Wang and Huazhong Yang, Rescuing Memristor-based Computing with Non-linear Resistance Levels, to appear in DATE 2018, 2018, pp.407-412.

[4] Ming Cheng, Lixue Xia, **Zhenhua Zhu**, Yi Cai, Yuan Xie, Yu Wang, Huazhong Yang, TIME: A Training-in-memory Architecture for RRAM-based Deep Neural Networks, to appear in IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2018.

[5] **Zhenhua Zhu**, Jilan Lin, Ming Cheng, Lixue Xia, Hanbo Sun, Xiaoming Chen, Yu Wang and Huazhong Yang, Mixed Size Crossbar based RRAM CNN Accelerator with Overlapped Mapping Method, in IEEE/ACM International Conference on Computer-Aided Design (ICCAD), 2018.

POSTER

[1] Wenqin Huangfu, **Zhenhua Zhu**, Tianqi Tang, Xing Hu, Yu Wang, Yuan Xie, GAME: GPU Acceleration of Metagenomics

Clustering, HPCA 2018 Workshop on Accelerator Architecture in Computational Biology and Bioinformatics.

[2] **Zhenhua Zhu**, Ming Cheng, Jilan Lin, Lixue Xia, Hanbo Sun, Xiaoming Chen, Yu Wang, Huazhong Yang, Mixed Size Crossbar based RRAM CNN Accelerator with Overlapped Mapping Method, DAC 2018 Work-In-Progress Workshop.

SCHOLARSHIP

- **Academic Excellence Award** 2017
- **Tsinghua - Liyuan Scholarship for Encourage** 2014, 2015, 2016
- **Academic Progress Scholarship** 2015, 2016
- **Social Work Scholarship** 2015, 2017
- **Friends of Tsinghua - Yicong Huang's Couple Scholarship** 2016

LEADERSHIP AND ACTIVITIES

- Community Department**, Youth League Committee of Tsinghua University | Leader Aug. 2017 - Present
 - Responsible for supervising communities in Tsinghua University.
- Charity and Goodwill Association** | Tsinghua University | Member Sept. 2014 – Aug. 2016
 - Organized fund-raising activities for migrant workers and their children in Beijing.
- Mongolian Culture Communication Association** | Tsinghua University | President Aug. 2017 - Aug.2018
- Grade director**, Dept. of E.E., Tsinghua Alumni Association Jun. 2018 - Present

LEARNING AND RESEARCH AREA & SKILLS

Learning and Research Area: RRAM, Computer Architecture, Processing-In-Memory

Programming Languages: Verilog, C/C++, Matlab, Python