

An Zou

Ph.D. Candidate (4th year)

Department of Electrical & Systems Engineering
Washington University in St. Louis

Updated: Oct. 30th 2019

Email: anzou@wustl.edu

GitHub: <https://github.com/zouan616/>

Personal Web: <https://zouan616.github.io/>

RESEARCH INTERESTS

Computer Architecture
Embedded System
Digital Circuit Design
Robotics

EDUCATION

- Washington University in St. Louis** St. Louis, MO, U.S.
 - *Ph.D. student in Electrical Engineering; GPA: 3.9/4.0; Advisor: Prof. Xuan Zhang* Aug. 2016 – present
 - M.S. in Electrical Engineering; Advisor: Prof. Xuan Zhang* Aug. 2016 – May 2019
- Harbin Institute of Technology** Harbin, China
 - *M.S. in Automation; GPA: 93/100, Rank: 1/161; Advisor: Prof. Hui Zhao* Aug. 2013 – July 2015
- Harbin Institute of Technology** Harbin, China
 - *B.S. in Automation; GPA: 91/100, Rank: 10/123* Aug. 2009 – July 2013

PROJECT EXPERIENCES

- Research Assistant @ XZ Group** Washington University in St. Louis
 - *Research Area: Computer Architecture and Embedded System* Aug. 2016 - Present
 - **GPU Real-time Scheduling for Artificial Intelligence Applications [1,3] (Aug. 2018 - Present)**
(CPU/GPU Architecture, Embedded System, Linux Operating System, Real-time Scheduling, CUDA Programming, Machine Learning)
 - Implement and characterize AI and ML applications on both embedded NVIDIA Jetson TX2 and GTX1080TI GPUs.
 - Partition and virtualize GPU resources (streaming multi-processor and memory) for multiple tasks and users.
 - Design real-time scheduling algorithms for parallel GPU accelerated AI and ML tasks with hard deadlines.
 - Optimize GPU energy and power efficiency under performance constraints.
 - **Meso Scale Cyber-Physical System Resource and Power Management (Apr. 2017 - Present)**
(Embedded System, Microcontroller, PCB Circuit Design)
 - Design mobile robot platforms PiCar based on a 1/18 scale RC car chassis.
 - Apply upper level intelligence algorithms like computer vision and SLAM on Raspberry Pi 3 / NVIDIA Jetson Tx2.
 - Implement lower level motion feedback control on Arduino.
 - Implement mobile robot sensing with YDLIDAR F4 lidar and Pi camera.
 - **Voltage Stacked Power Delivery for Manycore (GPU) System [4,5,6] (Mar. 2017 - Present)**
(CPU/GPU Architecture, Digital Circuit Design)
 - Enable circuit and architecture level GPU performance and power modelings.
 - Design control theory driven architecture level power managements with GPGPU-Sim 3.0 and Gem5.
 - Digital circuit design for the GPU performance and power controller.
 - Develop voltage stacked power delivery for manycore processors like GPUs.
 - **Integrated Voltage Regulator (IVR) Modeling and Power Management [2,7] (May 2016 - Present)**
(Processor Power Management, Digital Circuit Design, CPU/GPU Architecture)
 - Digital circuit design for different scale machine learning accelerators.
 - Model integrated voltage regulators (IVRs) such as buck, switched capacitor and LDO.
 - Develop open source IVR-enabled power delivery system modeling and simulation platform Ivory.
 - Design run-time managements for efficient and secure IVR-enabled power delivery for CPU/GPU/accelerators.

- Design robot angle measuring systems on inductosyns and photoelectric encoders with 1/3600 degree resolution.
- Design signal processing PCB boards with FPGA/DSP communicating with upper computers through ISA/PCI.
- Program air bearing rotary stage with Delta PMCA motion control to test and compensate angle measuring errors.

HONORS AND AWARDS

DAC Best Paper Nomination	2017
Graduate Fellowship The Ohio State University	2015
China National Scholarship	2014
First Level Graduate Student Scholarship	2014, 2013
People Scholarship	2013, 2012, 2011, 2010
Outstanding Student	2012
88412 Scholarship	2011
Individual Scholarship	2011
Student Travel Award	DAC 2017, Micro 2018

COMPETITION AWARDS

2014 National Postgraduate Mathematic Contest in Modeling (China)	The Second Prize
2011 National College Mathematical Contest in Modeling (MCM, U.S.)	Meritorious Winner Prize
2010 Zhejiang Undergraduate Student Physics Competition	The Third Prize

PUBLICATIONS

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1. **An Zou**, Jing Li, Christopher D. Gill, Xuan Zhang. "RTGPU: Real-Time GPU Scheduling of Parallel Hard Deadline Tasks with Fine-Grain Utilization." *IEEE Transactions on Parallel and Distributed Systems* 2019. (in preparation)
 2. **An Zou**, Huifeng Zhu, Jingwen Leng, Xin He, Yazhou Zu, Christopher D. Gill, Vijay Janapa Reddi, Xuan Zhang. "Ivory 2.0: Early-Stage Design Space Exploration Tool for Integrated Voltage Regulators and Its Power Delivery System" *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* 2019. (in preparation).
 3. Jinghao Sun, Jing Li, Zhishan Guo, **An Zou**, Xuan Zhang, Kunal Agrawal, Sanjoy Baruah. "Real-Time Scheduling upon a Host-Centric Acceleration Architecture with Data Offloading." *IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS'20)*, April 2020. (submitted).
 4. **An Zou**, Jingwen Leng, Xin He, Yazhou Zu, Christopher D. Gill, Vijay Janapa Reddi, Xuan Zhang. "Voltage-Stacked Power Delivery Systems: Reliability, Efficiency, and Power Management." *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* 2019. (minor revision).
 5. (MICRO 2018) **An Zou**, Jingwen Leng, Xin He, Yazhou Zu, Christopher D. Gill, Vijay Janapa Reddi, Xuan Zhang. "Voltage-stacked GPUs: A Control Theory Driven Cross-Layer Solution for Practical Voltage Stacking in GPUs." In *2018 51st Annual IEEE/ACM International Symposium on Microarchitecture*, pp. 390-402. IEEE, 2018.
 6. (DAC 2018) **An Zou**, Jingwen Leng, Xin He, Yazhou Zu, Vijay Janapa Reddi, Xuan Zhang. "Efficient and Reliable Power Delivery in Voltage-Stacked Manycore System with Hybrid Charge-Recycling Regulators." In *2018 55th ACM/ESDA/IEEE Design Automation Conference*, pp. 1-6. IEEE, 2018.
 7. (DAC 2017 Best Paper Nominations) **An Zou**, Jingwen Leng, Yazhou Zu, Tao Tong, Vijay Janapa Reddi, David Brooks, Gu-Yeon Wei, Xuan Zhang. "Ivory: Early-Stage Design Space Exploration Tool for Integrated Voltage Regulator." In *Proceedings of the 54th Annual Design Automation Conference*, p. 1. ACM, 2017.

8. **(CCC 2014) An Zou**, Hui Zhao, Yehan Ma and Da Li. Analysis Calculation and Testing of Rotary Inductosyn Angle Measuring Errors.” In *Proceedings of the 33rd Chinese Control Conference*, pp. 8091-8096. IEEE, 2014.
9. **(WCICA 2014) Da Li**, Hui Zhao, Honglin Xue and **An Zou**. “The Design and Implementation of Universal Interface Circuit for Photoelectric Encoder.” In *Proceeding of the 11th World Congress on Intelligent Control and Automation*, pp. 6006-6011. IEEE, 2014.

PROFESSIONAL SERVICE ACTIVITIES

DAC External Reviewer

2018,2019

MENTORED STUDENTS

Master students: *Adith Jagadish Boloor, Duhong Xu, Yunshen Huang*

Undergraduate students: *Feiyang Jin, Shadi Davari, Hayden Sierra, Shuhe Tian, Chenyang Wang*

TECHNICAL SKILLS

Over 7 years experiences in Computer Engineering: *CPU/GPU Architecture, Embedded Software, Digital Circuit Design, Linux Operating System, Real-time OS Scheduling, FPGA/DSP, PCB Circuit Design, CUDA Programming, OpenCL, Machine Learning*

Programming Languages: *C/C++ (7+ years); Verilog (5+ years); CUDA; Python; M language; Latex*

Software: *Cadence Tools; Synopsys Tools; CCS; Quartus2; Altium Designer; MATLAB*