An Zou

Ph.D. Candidate (4th year)
Department of Electrical & Systems Engineering
Washington University in St. Louis

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RESEARCH INTERESTS

Computer Architecture
Embedded System
Digital Circuit Design
Robotics

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*

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.

- **Research Assistant @ Control and Simulation Center**   **Harbin Institute of Technology**
Research Area: High Precision Servo Robot System   *Sep. 2012 - July 2015*
- High Precision Angle Measurement System for Servo Robot [8,9] (Sep. 2012 - July 2015)
(Embedded System, PCB Circuit Design, FPGA/DSP, Microcontroller, Control, Robotics, C++ Commercial Software)
- 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 Price*
2011 National College Mathematical Contest in Modeling (MCM, U.S.)	*Meritorious Winner Prize*
2010 Zhejiang Undergraduate Student Physics Competition	*The Third Prize*

Publications

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*