

# An Zou

Ph.D. Candidate (4th year)

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

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## RESEARCH INTERESTS

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*Embedded System*  
*Computer Architecture*  
*Digital Circuit Design*  
*Robotics*

## EDUCATION

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- 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

## RESEARCH EXPERIENCE

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- 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 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 - Aug. 2018)**  
(Digital Circuit Design, CPU/GPU Architecture )
    - Model voltage stacked power delivery for manycore processors like GPUs.
    - Propose hybrid circuit level (SPICE 3) charge recycling to mitigate supply voltage noise with worse case guarantee.
    - Design control theory driven architecture level (GPGPU-Sim 3.0) power managements.
    - Enable high level power managements like DVFS and power gating collaboration with voltage stacking.
  - **Integrated Voltage Regulator (IVR) Modeling and Power Management [2,7] (May 2016 - Present)**  
(Digital Circuit Design, Processor Power Management, CPU/GPU Architecture )
    - 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 static and run-time managements for efficient and secure IVR-enabled power delivery.

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)

(PCB Circuit Design, Embedded System Programming, FPGA/DSP, Microcontroller, Robotics Control, VC++ 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

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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

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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 (RTAS20)*, 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

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*DAC External Reviewer*

*2018,2019*

## MENTORED STUDENTS

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

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

## TECHNICAL SKILLS

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