# An Zou

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

Updated: Jan. 1st 2020
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## RESEARCH INTERESTS

*Computer Architecture*
*Embedded System*
*Digital Circuit Design*
*Machine Learning*
*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*

## PROFESSIONAL EXPERIENCE

**Washington University in St. Louis**                                   St. Louis, MO, U.S.
- *Graduate Research Assistant*     *Aug. 2016 – present*

**Harbin Institute of Technology**                                   Harbin, China
- *Graduate Research Assistant*     *Sep. 2012 – Jul. 2015*

## RESEARCH EXPERIENCE

**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 [J1, C1] (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 [J3, C2, C3] (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 [J2, C4] (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.
– Machine learning based IVR-enabled fast power management (DVFS) on CPU/GPU heterogeneous systems.

- **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 [C6] (Sep. 2012 - July 2015)**
 **(PCB Circuit Design, Embedded System Programming, FPGA/DSP, Microcontroller, Robotics Control)**
 – Design robot angle measuring systems on inductosyns and photoelectric encoders with 1/3600 degree resolution.
 – Design signal processing PCB boards with FPGA/CPLD communicating with upper computers through ISA/PCI.
 – Implement neural network based error compensation algorithm on DPS for robot angle measuring systems.

 **- C++ Control Software for High Precision Servo Robot [C5] (Sep. 2012 - July 2013)**
 **(VC++ Commercial Software, Industrial Personal Computer, Robotics Control)**
 – Develop Industrial Personal Computer (IPC) program for air bearing rotary stage and error automatically test system.
 – Program Delta Tau PMAC motion control board for servo motor control.

## PUBLICATIONS

**Journals:**

J1. **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)**

J2. **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)**.

J3. **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)**.

**Conferences:**

C1. **(RTAS 2020)** 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. April 2020.* **(accepted)**.

C2. **(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.

C3. **(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.

C4. **(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.

C5. **(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.

C6. **(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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| *Design Automation Conference (DAC) External Reviewer* | *2018,2019,2020* |
| *Journal of Signal Processing System Reviewer* | *2020* |

## Honors and Awards

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| *A. Richard Newton Young Student Fellow Award* | *2017* |
| *DAC Best Paper Nomination* | *2017* |
| *Graduate Fellowship The Ohio State University* | *2015* |
| *China National Scholarship* | *2014* |
| *The Second Price of National Postgraduate Mathematics Contest in Modeling (China)* | *2014* |
| *The First Level Graduate Student Scholarship* | *2014,2013* |
| *People Scholarship* | *2013,2012,2011,2010* |
| *Outstanding Student* | *2012* |
| *Meritorious Winner Prize of National College Mathematical Contest in Modeling (MCM, U.S.)* | *2011* |
| *88412 Scholarship* | *2011* |
| *Individual Scholarship* | *2011* |

## 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 System, PCB Circuit Design, Digital Circuit Design, FPGA/DSP, 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*