

# SHULIN ZHAO

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## SUMMARY AND OBJECTS

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I am a fifth-year Ph.D candidate in Computer Science at Penn State, USA. I enjoy doing research to solve real world design challenges. I have strong engineering and research experiences, with 8 publications on top-tier conferences. *I am seeking full-time positions in fall 2021, in the areas of AI-powered IoT/Edge, VR/AR, and Video Processing.*

## EDUCATION

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### Pennsylvania State University

2016 - present

Ph.D. Candidate in Computer Science and Engineering

Advisors: Dr. Mahmut Taylan Kandemir, Dr. Anand Sivasubramaniam, and Dr. Chita Das

Overall GPA: 3.7/4.0

### Shandong University

2013 - 2016

M.S. in Computer Science and Technology

Overall GPA: 3.8/4.0

### Shandong University

2008 - 2012

B.S. in Control Science and Engineering

Overall GPA: 3.2/4.0

## RESEARCH

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### 1. Video Processing

2017 - present

Computer System Lab (CSL)

Pennsylvania State University

#### a) Virtual Reality (VR) 360° Video Processing

First-authored

- Reduction in data size by data-flow optimizations in Codecs
- Control-flow memoization in GPU to bypass computes

#### b) Video Compression

Co-authored

- Reduce memory access by hardware caching
- Greater compression by crossing out non-critical bits

### 2. Internet of Things

2017 - present

Computer System Lab (CSL)

Pennsylvania State University

#### a) Enable DNN Inference on Edge

First-authored

- Boost throughput via distribution of DNN inference in local IoT
- Model-SoC co-design to optimize AI applications in IoT
- Enhance framework to scale-out and scale-up/down

#### b) Sensing Events Optimization

First-authored

- Near-data-compute by local batching and kernel bypassing
- Energy-efficient IoT executions by dynamic partitioning

### 3. Mobile Systems [*Note: Joined late*]

2016 - 2017

Computer System Lab (CSL)

Pennsylvania State University

#### a) Speedup CPU Execution on Mobile Phones

Co-authored

- Fuse critical instruction chains as macro units and execute them earlier
- Identify such critical instruction chains with an offline profiler
- Double the fetch bandwidth by exploiting ARM's 16-bit ISA with a customized compiler

#### b) Relief Memory Stress

Co-authored

- Schedule memory requests with a global view of all accelerators on mobile phones

## INTERNSHIP EXPERIENCE

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<b>Kwai Inc</b> <i>Y-Lab, Palo Alto, CA, USA</i> · Neural Network (NN) model compression and compiler optimizations on edge devices	05/2020 - 08/2020 <i>Research Intern</i>
<b>Lenovo</b> <i>Networking and System, Shanghai, China</i> · Lenovo OpenStack backend manager, Horizon, monitor plugins	04/2016 - 08/2016 <i>Software Engineer</i>
<b>Inspir</b> <i>Technology Center, Jinan, Shandong, China</i> · Speedup Read/Write by memory reservation and cache re-allocation	04/2014 - 04/2015 <i>Intern Engineer</i>

## SELECTED PUBLICATIONS

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- [C1]. Prasanna V. Rengasamy, Haibo Zhang, **Shulin Zhao**, Anand Sivasubramaniam, Mahmut Kandemir, Chita Das. "Selective Event Processing for Energy Efficient Mobile Gaming with SNIP", *To Appear In Proceedings of the 2020 IEEE International Symposium on Workload Characterization*. (**Accepted, IISWC 2020**)
- [C2]. **Shulin Zhao**, Haibo Zhang, Sandeepa Bhuyan, Cyan S. Mishra, Ziyu Ying, Mahmut Kandemir, Chita Das, Anand Sivasubramaniam. "Deja View: Spatio-Temporal Compute Reuse for Energy-Efficient 360-degree VR Video Streaming", *To Appear In Proceedings of the 47th IEEE/ACM International Symposium on Computer Architecture*. (**Accepted, ISCA 2020**)
- [C3]. Haibo Zhang, **Shulin Zhao**, Ashutosh Pattnaik, Mahmut Kandemir, Anand Sivasubramaniam, Chita Das. "Distilling the Essence of Raw Video to Reduce Memory Usage and Energy at Edge Devices", *In Proceedings of The 52th Annual IEEE/ACM International Symposium on Microarchitecture*. (**MICRO 2019**)
- [C4]. **Shulin Zhao**, Prasanna V. Rengasamy, Haibo Zhang, Sandeepa Bhuyan, Nachiappan C. Nachiappan, Anand Sivasubramaniam, Mahmut Kandemir, Chita Das. "Understanding Energy Efficiency in IoT App Executions", *In Proceedings of The 39th IEEE International Conference on Distributed Computing Systems*. (**ICDCS 2019**)
- [C5]. Prasanna V. Rengasamy, Haibo Zhang, **Shulin Zhao**, Nachiappan C. Nachiappan, Anand Sivasubramaniam, Mahmut Kandemir, Chita Das. "CritICs Critiquing Criticality in Mobile Apps", *In proceedings of The 51th Annual IEEE/ACM International Symposium on Microarchitecture*. (**MICRO 2018**)
- [C6]. Haibo Zhang, Prasanna V. Rengasamy, Nachiappan C. Nachiappan, **Shulin Zhao**, Anand Sivasubramaniam, Mahmut Kandemir, Chita R Das. "FLOSS: FLOW Sensitive Scheduling on Mobile Platforms", *In Proceedings of the 55th Annual Design Automation Conference*. (**DAC 2018**)
- [C7]. Prasanna V. Rengasamy, Haibo Zhang, Nachiappan C. Nachiappan, **Shulin Zhao**, Anand Sivasubramaniam, Mahmut Kandemir, Chita Das. "Characterizing Diverse Handheld Apps for Customized Hardware Acceleration", *In proceedings of 2017 IEEE International Symposium on Workload Characterization*. (**IISWC 2017**)
- [C8]. Haibo Zhang, Prasanna V. Rengasamy, **Shulin Zhao**, Nachiappan C. Nachiappan, Anand Sivasubramaniam, Mahmut Kandemir, Ravi Iyer, Chita Das. "Race-to-sleep + Content Caching + Display Caching: a Recipe for Energy-efficient Video Streaming on Handhelds", *In proceedings of The 50th Annual IEEE/ACM International Symposium on Microarchitecture*. (**MICRO 2017**)

## TEACHING EXPERIENCE

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<b>Teaching Assistant, Penn State</b> <i>Operating Systems</i>	Fall 2016 <i>CMPSC 473</i>
<b>Guest Lecture, Penn State</b> · CSE 597: Advances and Applications in Deep Learning · CSE 598: Advances in Computer Architecture	Spring 2017 Fall 2018

## TALKS

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**Deja View: Spatio-Temporal Compute Reuse for Energy-Efficient 360-degree VR Video Streaming**  
*ISCA 2020* *June 2020, Online*

**Understanding Energy Efficiency in IoT App Executions**  
*ICDCS 2019* July 2019  
*Dallas, Texas, USA*

## HONORS AND AWARDS

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### **Student Travel Grant**

- Travel Grant for MICRO October 2017
- Travel Grant for ICDCS July 2019

## REFERENCES

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References are available on request.