

# Yizhou Shan

Ph.D. Candidate  
UCSD Computer Science and Engineering

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## Research Interests

My research interests span Distributed System, Operating System, and Computer Architecture, with a focus on building fast and reliable systems for datacenters. I work at Wuklab, UCSD, under the supervision of Prof. Yiyang Zhang.

## Education

<b>University of California, San Diego</b> Ph.D. in Computer Science	2019-2022
<b>Purdue University</b> Ph.D. in Computer Engineering (Transferred to UCSD)	2016-2019
<b>Beijing University of Aeronautics and Astronautics (BUAA)</b> B.E. in Computer Engineering	2010-2014

## Industry Experiences

<b>Microsoft Research</b> - Intern Mentors: Ziqiao Zhou, Weidong Cui, Andrew Baumann, Marcus Peinado	Virtual 2021
<b>VMware Research</b> - Intern Mentor: Marcos K. Aguilera	Palo Alto, CA 2019
<b>VMware Research</b> - Intern Mentor: Stanko Novakovic	Palo Alto, CA 2018
<b>ICT, Chinese Academy of Sciences</b> - Research Assistant Mentors: Zhiwei Xu, Jin Xiong, Dejun Jiang	Beijing, China 2014-2016

## Publications

- [7] **De-Virtualize the Virtualized Cloud for Performance *and* Security** *Submission*  
Ziqiao Zhou, *Yizhou Shan*, Weidong Cui, Xinyang Ge, Marcus Peinado, Andrew Baumann
- [6] **Disaggregating and Consolidating Network Functionalities with SuperNIC** [\*arXiv\*](#)  
*Yizhou Shan*, Will Lin, Ryan Kosta, Arvind Krishnamurthy, Yiyang Zhang
- [5] **Clio: A Hardware-Software Co-Designed Disaggregated Memory System** [\*ASPLOS '22\*](#)  
*Yizhou Shan*\*, Zhiyuan Guo\*, Xuhao Luo, Yutong Huang, Yiyang Zhang (co-first authors)
- [4] **Disaggregating Persistent Memory and Controlling Them Remotely:  
An Exploration of Passive Disaggregated Key-Value Stores** [\*ATC '20\*](#)  
*Shin-Yeh Tsai, Yizhou Shan, Yiyang Zhang*
- [3] **Storm: a Fast Distributed Storage System Using Remote Memory Primitives** [\*SYSTOR '19\*](#)  
*Best Paper*  
Stanko Novakovic, *Yizhou Shan*, Aasheesh Kolli, Michael Cui, Yiyang Zhang, Haggai Eran, Liran Liss, Michael Wei, Dan Tsafirir, Marcos Aguilera

[2] **LegoOS: A Disseminated, Distributed OS for Hardware Resource Disaggregation** [\*OSDI'18\*](#)  
*Yizhou Shan, Yutong Huang, Yilun Chen, Yiyang Zhang* [\*Best Paper\*](#)

[1] **Distributed Shared Persistent Memory** [\*SoCC '17\*](#)  
*Yizhou Shan, Shin-Yeh Tsai, Yiyang Zhang*

## Workshops and Posters

[6] **Challenges in Building and Deploying Disaggregated Persistent Memory** [\*NVMW '19\*](#)  
*Yizhou Shan, Yutong Huang, Yiyang Zhang*

[5] **Distributed Shared Persistent Memory** [\*NVMW '18\*](#)  
*Yizhou Shan, Shin-Yeh Tsai, Yiyang Zhang*

[4] **Disaggregating Memory with Software-Managed Virtual Cache** [\*WAMS '18\*](#)  
*Yizhou Shan, Yiyang Zhang*

[3] **Disaggregated Operating System** [\*HPTS '17\*](#)  
*Yiyang Zhang, Yizhou Shan, Sumukh Hallymysore*

[2] **Lego: A Distributed, Decomposed OS for Resource Disaggregation** [\*SOSP '17\*](#)  
*Yizhou Shan, Yilun Chen, Yutong Huang, Sumukh Hallymysore, Yiyang Zhang* [\*Poster\*](#)

[1] **Disaggregated Operating System** [\*SoCC '17\*](#)  
*Yizhou Shan, Sumukh Hallymysore, Yutong Huang, Yilun Chen, Yiyang Zhang* [\*Poster\*](#)

## Professional Services

### Program Committee

EuroSys '22 (Shadow PC)  
EuroSys '21 (Shadow PC)  
ASPLOS '21 (External PC)

### Journal Review

Journal of Systems Research: 2021 - Current  
ACM Transactions on Architecture and Code Optimization (TACO): 2021  
ACM Transactions on Storage (TOS): 2020  
IEEE/ACM Transactions on Networking: 2020

### Artifact Evaluation

SOSP'21 (Artifact Evaluation)  
OSDI '20 (Artifact Evaluation)

## Teaching

TA for UCSD [CSE120](#) Undergraduate Operating System

## Awards

[2020 Facebook Fellowship Finalist](#)  
SYSTOR'19 Best Paper Award  
OSDI '18 Jay Lepreau Best Paper Award

OSDI '18 Student Travel Grant  
SOSP '17 Student Travel Grant  
SoCC '17 Student Travel Grant

## Research Experiences

- Network Design for Disaggregated Datacenter** (Work-in-Progress) 2020-Current  
*UCSD*  
How to build a disaggregated datacenter when both the number of network ports and bandwidth requirement exploded? We propose a way to solve this issue without disrupting the existing network infrastructure.
- Programmable Disaggregated Memory System** (Under Submission) 2018-Current  
*Purdue University and UCSD*  
We are building a hardware-based active disaggregated memory system using FPGA. This is a follow-up work of LegoOS. We build a distributed hardware-based virtual memory system, and a framework for building memory services.
- Serverless on Disaggregated Datacenter** (WIP) 2019-Current  
*UCSD*  
We are trying to demonstrate when serverless means no server. Instead of using monolithic machines, we explore the possibility of using a disaggregated datacenter. Instead of optimizing existing VM and container technologies, we explore a new way to run serverless functions: using library OS.
- An Operating System Inside Cloud FPGA** (Concluded) 2019-2020  
*UCSD*  
We are building a new operating system inside a cloud FPGA. This new runtime overcomes the limitations of static compile-time approaches and provides a set of new services. We explored how this helps reduce cost and enable new FPGA apps.
- Optimize Page Faults** 2019 May-Aug  
*VMware Research*  
Ancient old page fault handling is the driving wheel for many emerging datacenter systems and applications. But the page fault handling mechanism was designed for millisecond-level disk operations, there is a performance mismatch when it is used by fast devices like RDMA, or PM. We are now trying to close the gap.
- LegoOS: A Disaggregated Operating System** 2017-2018  
*Purdue University*  
We propose a new OS model called the splitkernel to manage disaggregated systems. Splitkernel disseminates traditional OS functionalities into loosely-coupled monitors, each of which runs on and manages a hardware component. Using the splitkernel model, we built LegoOS, a new OS designed for hardware resource disaggregation.
- Hotpot: Distributed Shared Persistent Memory** 2016-2017  
*Purdue University*  
We propose Distributed Shared Persistent Memory (DSPM), a new framework for using persistent memories in datacenter environments. We designed and implemented *Hotpot*, the first DSPM system in the Linux kernel. Hotpot provides low-latency, transparent memory accesses, data persistence, data reliability and high availability.
- Non-Volatile Memory (NVM) Emulator** 2015-2016  
*Institute of Computing Technology, Chinese Academy of Sciences*  
We designed and implemented a NVM emulator in Linux kernel, which leverages Intel's Performance Monitoring Unit to emulate NVM's slower read/write latency and smaller bandwidth on physical DRAM. This emulator runs on bare-metal x86 machines.
- ARMv8 CPU Project** 2013  
*Institute of Computing Technology, Chinese Academy of Sciences*  
I participated in the Register-Transfer Level design and verification of some blocks within the cache unit and load-store unit. It is a commercial project collaborated with Huawei.

## Skills

**Languages:** x86 Assembly, C, C++, Python, Scala, Rust, Go, TCL, Verilog, Java  
**Systems:** Linux Kernel, DPDK/RDMA, KVM, QEMU, Docker, k8s, Pytorch, Tensorflow, Spark, Memcached, Vivado, Vivado HLS, Vitis, SpinalHDL, Chisel