

# Sudarsun Kannan

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Department of Computer Science,  
Rutgers University–New Brunswick  
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<https://www.cs.rutgers.edu/~sk2113/>

## Research Interests

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Operating Systems, Computer Architecture, Storage, Distributed Systems

## Academic Experience

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### Rutgers University–New Brunswick

Assistant Professor, Dept. of Computer Science

Sep. 2018 - Current

### University of Wisconsin-Madison

Postdoctoral Research Associate, Dept. of Computer Sciences

Sep. 2016 - Aug. 2018

Advisers - Prof. Remzi H. Arpaci-Dusseau and Prof. Andrea C. Arpaci-Dusseau

### Georgia Institute of Technology, Atlanta

Ph.D. in Computer Science

May 2010 - Aug 2016

Thesis: Operating System Support for Heterogeneous Memory

Advisers - Prof. Karsten Schwan (demised), Prof. Ada Gavrilovksa

### Georgia Institute of Technology, Atlanta

M.S in Computer Science

Aug 2008 - May 2010

Masters Research Project: Virtual Storage for Mobile Devices

Advisers - Prof. Karsten Schwan (demised), Prof. Ada Gavrilovksa

### Anna University, Chennai

B.E in Computer Science (with distinction)

July 2001- May 2005

Research project: Embedded Web Server Management

## Reviewed Publications [Google Scholar](#)

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Yujie Ren, Changwoo Min, **Sudarsun Kannan**

OSDI '20

CrossFS: A Cross-layered Direct-Access File System

14th USENIX Symposium on Operating Systems Design and Implementation, 2020

Shaleen Garg, Manish Parashar, **Sudarsun Kannan**

MEMSYS '20

The Need for Precise and Efficient Memory Capacity Budgeting

The International Symposium on Memory Systems, 2020

Yujie Ren, Jian Zhang, **Sudarsun Kannan**

HotStorage '20

CompoundFS: Compounding I/O Operations in Firmware File Systems

USENIX Workshop on Hot Topics in Storage and File Systems, 2020

Babar Khalid, Nolan Rudolph, Ramakrishnan Durairajan, **Sudarsun Kannan**

HotStorage '20

MicroMon: A Monitoring Framework for Tackling Distributed Heterogeneity

USENIX Workshop on Hot Topics in Storage and File Systems, 2020

David Domingo, **Sudarsun Kannan**, Kyle Stratton

VAULT '20

Accelerating Filesystem Checking and Repair with pFSCK

USENIX Linux Storage and Filesystems Conference, 2020

R.Madhava Krishnan, Jaeho Kim, Ajit Mathew, Anthony Demeri, Xinwei Fu,

ASPLOS '20

Changwoo Min, **Sudarsun Kannan**

Durable Transactional Memory Can Scale with TimeStone

Architectural Support for Programming Languages and Operating Systems, 2020

Jun He, Kan Wu, **Sudarsun Kannan**, Andrea Arpaci-Dusseau, Remzi Arpaci-Dusseau

FAST '20

Read as Needed: Building WiSER, a Flash-Optimized Search Engine

USENIX Conference on File and Storage Technologies, 2020

Christopher Misa, <b>Sudarsun Kannan</b> , Ramakrishnan Durairajan Can We Containerize Internet Measurements? Applied Networking Research Workshop, 2019	<b>ANRW '19</b>
Jing Liu, Andrea Arpaci-Dusseau, Remzi Arpaci-Dusseau, <b>Sudarsun Kannan</b> File System Process USENIX Workshop on Hot Topics in Storage and File Systems, 2019	<b>HotStorage '19</b>
<b>Sudarsun Kannan</b> , Ada Gavrilovska, Vishal Gupta, Karsten Schwan HeteroOS - OS Design for Heterogeneous Memory Management in Datacenter ACM SIGOPS Operating Systems Review 2018.	<b>OS Review '18</b>
<b>Sudarsun Kannan</b> , Nitish Bhat, Ada Gavrilovska Andrea Arpaci-Dusseau, Remzi Arpaci-Dusseau Redesigning LSMs for Nonvolatile Memory with NovelSM USENIX Annual Technical Conference, 2018	<b>ATC '18</b>
Pradeep Fernando, <b>Sudarsun Kannan</b> , Ada Gavrilovska Greg Eisenhauer Accelerating HPC Workflows with NVRAM-based Transport for Streaming Objects 26th Symposium on High-Performance Parallel and Distributed Computing, 2018 (To Appear)	<b>HPDC '18</b>
<b>Sudarsun Kannan</b> , Andrea Arpaci-Dusseau, Remzi Arpaci-Dusseau Yuangang Wang, Jun Xu, Gopinath Palani Designing a True Direct-Access File System with DevFS USENIX Conference on File and Storage Technologies, 2018	<b>FAST '18</b>
<b>Sudarsun Kannan</b> , Ada Gavrilovska, Vishal Gupta, Karsten Schwan HeteroOS - OS Design for Heterogeneous Memory Management in Datacenter 44th International Symposium on Computer Architecture, 2017.	<b>ISCA '17</b>
Jun He, <b>Sudarsun Kannan</b> , Andrea Arpaci-Dusseau, Remzi Arpaci-Dusseau The Unwritten Contract of Solid State Drives European Conference on Computer Systems, 2017.	<b>EuroSys '17</b>
<b>Sudarsun Kannan</b> , Moinuddin Qureshi, Ada Gavrilovska, Karsten Schwan Reducing Energy Overheads of Memory-based Persistence in NVMs 25th International Conference on Parallel Architectures and Compilation Techniques, 2016.	<b>PACT '16</b>
Pradeep Fernando, <b>Sudarsun Kannan</b> , Ada Gavrilovska, Karsten Schwan Phoenix: Memory Speed HPC I/O with NVM 23rd annual IEEE International Conference on High Performance Computing, Data, and Analytics, 2016.	<b>HiPC '16</b>
<b>Sudarsun Kannan</b> , Ada Gavrilovska, Karsten Schwan pVM – Persistent Virtual Memory for Efficient Capacity Scaling and Object Storage European Conference on Computer Systems, 2016.	<b>EuroSys '16</b>
<b>Sudarsun Kannan</b> , Moinuddin Qureshi, Ada Gavrilovska, Karsten Schwan Energy Aware Persistence: Reducing the Energy Overheads of Persistent Memory Computer Architecture Letters, 2015 (also presented at NVMW 2016).	<b>CAL '15</b>
<b>Sudarsun Kannan</b> , Naila Farooqui, Ada Gavrilovska, Karsten Schwan HeteroCheckpoint: Efficient Checkpointing for Accelerator-based Systems 4th Workshop on Fault-Tolerance for HPC at Extreme Scale (in DSN), 2014.	<b>FTXS '14</b>
<b>Sudarsun Kannan</b> , Ada Gavrilovska, Karsten Schwan Reducing the Cost of Persistence for NonvolatileHeaps in End User Devices 20th International Symposium on High Performance Computer Architecture, 2014.	<b>HPCA '14</b>
<b>Sudarsun Kannan</b> , Ada Gavrilovska, Karsten Schwan NVM Heaps for Accelerating Browser-based Applications USENIX Interactions of NVM/Flash with Operating Systems and Workloads, 2013.	<b>INFLOW '13</b>
<b>Sudarsun Kannan</b> , Ada Gavrilovska, Karsten Schwan, Dejan Milojicic Optimizing Checkpoints Using NVM as Virtual Memory 27th IEEE International Parallel & Distributed Processing Symposium, 2013.	<b>IPDPS '13</b>

**Sudarsun Kannan**, Ada Gavrilovska, Karsten Schwan, Dejan Milojicic, Vanish Talwar  
Using Active NVRAM for I/O Staging  
Petascale Data Analytics: Challenges and Opportunities, SC workshop, 2011.

PDAC '11

**Sudarsun Kannan**, Ada Gavrilovska, and Karsten Schwan  
Cloud4Home – Enhancing Data Services with @Home Clouds  
31st International Conference on Distributed Computing Systems, 2011.

ICDCS '11

**Sudarsun Kannan**, Karishma Babu, Ada Gavrilovska, Karsten Schwan  
VStore++: Virtual Storage Services for Mobile Devices  
International Workshop on Mobile Computing and Clouds, 2010.

MobiCloud '10

## Short Papers and Posters

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**Sudarsun Kannan**, Ada Gavrilovska, Vishal Gupta, Karsten Schwan  
HeteroOS - OS Design for Heterogeneous Memory Management in Datacenter  
Non-volatile Memories Workshop (NVMW), 2018, University of California San Diego.

Jun He, **Sudarsun Kannan**, Andrea Arpaci-Dusseau, Remzi Arpaci-Dusseau  
The Unwritten Contract of Solid State Drives  
Non-volatile Memories Workshop (NVMW), 2018, University of California San Diego.

**Sudarsun Kannan**, Moinuddin Qureshi, Ada Gavrilovska, and Karsten Schwan  
Energy Aware Persistence for Nonvolatile Memory  
Non-volatile Memories Workshop (NVMW), 2016, University of California San Diego.

Pradeep Fernando, **Sudarsun Kannan**, Ada Gavrilovska, Karsten Schwan  
Fast Restarts/Recovery with NVM memory for HPC systems  
Non-volatile Memories Workshop (NVMW), 2015, University of California San Diego.

**Sudarsun Kannan**, Ada Gavrilovska, and Karsten Schwan  
Reducing I/O Sandboxing Overheads for Browser-based Applications  
Non-volatile Memories Workshop (NVMW), 2013, University of California San Diego.

**Sudarsun Kannan**, Ada Gavrilovska, and Karsten Schwan  
Rich Client Services using Persistent Memory  
Non-volatile Memories Workshop (NVMW), 2012, University of California San Diego.

Hrishi Amur, Alex Merritt, **Sudarsun Kannan**, Ada Gavrilovska, and Karsten Schwan  
MESSY Library for Memory Consistency on 48 core Intel SCC  
Intel Marc Symposium 2011, Hillsboro.

## Patents

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**Sudarsun Kannan**, Palo Faraboschi, Murray McLaren, Dejan Milojicic  
Checkpoint Generation  
U.S. Patent, Publication number US20140214770 A1.

**Sudarsun Kannan**, Dejan Milojicic, Vanish Talwar  
Active Non Volatile Memory Post Processing  
U.S. Patent, Publication number US9619430 B2.

James E. Donahue, Ricky Ho, **Sudarsun Kannan**, Pradnyesh S. Gore  
System and Method for Installation and Management of Cloud-Independent Multi-Tenant Applications  
U.S. Patent, Publication number US8812627 B2.

## Teaching @ Rutgers

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### Instructor

CS 416 - Operating Systems Design  
Instructor Rating: 4.27 on 5, Course Rating: 4.40 on 5

Spring 2020

### Instructor

CS 519 - Operating Systems Theory  
Instructor Rating: 4.64 on 5, Course Rating: 4.45 on 5

Fall 2019

**Instructor**

CS 416 - Operating Systems Design  
 Instructor Rating: 4.21 on 5, Course Rating: 4.05 on 5

Spring 2019

**Instructor**

CS 519 - Operating Systems Theory  
 Instructor Rating: 4.17 on 5, Course Rating: 4.33 on 5

Fall 2018

**Research Advising @ Rutgers**

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Yujie Ren (Post Quals), 2nd Year PhD Student File System for Moddern Cloud Datacenters	Fall 2018-current
Shaleen Garg, 1st Year PhD Student High Performance Computing	Fall 2019-current
David Domingo, 2nd Year PhD Student File System Reliability	Fall 2018-current
Kyle Strator, Undergraduate Student File System Reliability	Fall 2018-current

**Rutgers and CS Departmental Services**

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Fall 2018 - Current: Rutgers Honors Faculty Mentor  
 Fall 2018 - Summer 2019: Faculty Recruitment Committee  
 Fall 2019 - Spring 2020: Graduate Committee  
 Fall 2018 - Current: Systems Reading Group Organizer

**PhD Defense Committee**

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Alex Conway, Spring 2020, Understanding Dictionaries at the Intersection of Theory and Practice  
 Shaohua Duan, Spring 2020, Addressing Fault Tolerance for Staging Based Scientific Workflows  
 Adarsh Yoga, Fall 2019, Parallelism-Driven Performance Analysis Techniques for Task Parallel Programs  
 Zi Yan, Fall 2018, Virtual Memory for Next-Generation Tiered Memory Architectures

**Panels - Conference and Journal Services**

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2020 - Program Committee - USENIX Workshop on Hot Topics in Storage and File Systems (HotStorage)  
 2020 - Program Committee - USENIX Annual Technical Conference (USENIX ATC)  
 2020 - Program Committee - International Parallel & Distributed Processing Symposium (IEEE IPDPS)  
 2019 - Best Paper Award Committee - 10th Annual Non-Volatile Memories Workshop (NVMW)  
 2019 - Session Chair - 10th Annual Non-Volatile Memories Workshop (NVMW)  
 2019 - Review Panel - National Science Foundation - Scalable Parallelism in the Extreme  
 2019 - Program Committee - USENIX Annual Technical Conference (USENIX ATC)  
 2019 - Extended Review Committee - 46th International Symposium on Computer Architecture (ISCA)  
 2019 - Program committee - IEEE International Conference on Cloud Engineering (IC2E)  
 2019 - Program committee - 35th International Conference on MassiveStorage Systems and Technology (MSST)  
 2019 - Program committee - 10th Annual Non-Volatile Memories Workshop (NVMW)  
 2018 - Reviewer - IEEE Computer Architecture Letters (CAL)

2017 - Program committee - 46th International Conference on Parallel Processing (ICPP) 2017 - Reviewer - IEEE Transactions on Computers (TC)

2017 - Shadow PC committee - European Conference on Computer Systems (EuroSys) 2017 - Reviewer - Science of Computer Programming

2016 - Shadow PC committee - European Conference on Computer Systems (EuroSys)

2016 - Reviewer - IEEE Computer Architecture Letters (CAL)

2016 - Reviewer - IEEE Transactions on Computers (TC)

2014 - Reviewer - IEEE Transactions on Cloud Computing (TCC)

2012 - Reviewer - IEEE Transactions on Parallel and Distributed Systems (TPDS)

## Teaching Before 2018

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### Guest Lecturer, UW-Madison

CS 461 - Advanced Operating Systems, Fault tolerance and recovery Spring 2017

### Guest Lecturer, UW-Madison

CS 461 - Distributed Systems, Logical clocks, SSD storage Fall 2017

### Head Teaching Assistant, Georgia Tech

CS 3210 - Undergraduate OS Introduction, Lectures, project design, grading Spring 2016

### Guest Lecturer, Georgia Tech

CS 3210, Undergraduate OS Introduction, OS memory management, synchronization Spring 2015

### Guest Lecturer, Georgia Tech

CS 6210 - Advanced OS, OS memory management, synchronization, virtualization Fall 2014

### Teaching Assistant, Georgia Tech

CS 4210 - Graduate OS Introduction, Lectures, project design and grading Fall 2012

## Student Mentoring

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Tanvi Bhagwat, BS Student at UW-Madison Summer 2018- Fall 2018  
Device-level File System

Abigail Matthews, BS Student at UW-Madison Summer 2018- Fall 2018  
Device-level File System

Tianyi Shan, BS Student at UW-Madison Summer 2018- Fall 2018  
Device-level File System

Hakan Memisoglu, Ph.D. Student at UW-Madison Fall 2017- Fall 2018  
Optimizing file system for fast storage

Pradeep Fernando, Ph.D. Student at Georgia Tech Fall 2015- Fall 2018  
Resilience in HPC applications and other topics

Thaleia-Dimitra Doudali, Ph.D. Student at Georgia Tech Spring 2016  
Resource allocation in Cloud

Andrea Hu, BS Student at Georgia Tech Spring 2016  
Graph analytics and storage performance

Albert, BS Student at Georgia Tech Spring 2016  
Persistent memory durability overheads

Nitish Bhatt, MS Student at Georgia Tech (now at VMWare) 2016  
NoSQL database on new memory technologies

Amaro Emmanuel, MS Student at Georgia Tech, (Ph.D. Student, U.C. Berkeley) Spring 2015  
Reducing virtualization system call cost

Preethi Sreenivasan, MS Student at Georgia Tech, (now at Amazon) Architectural analysis of thin clients	Summer 2015
Ravi Mangal, Ph.D. Student at Georgia Tech Virtual storage for @home cloud	Spring 2011
Sasi Siddharth, MS Student @ Georgia Tech, (now at HP) Virtual storage for @home cloud	Spring 2011

## Grants

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National Science Foundation CNS Grant Award, File System Offloading, Oct. 2019 - Sept. 2022, \$499,839.00, Role: Principal Investigator, Rutgers University

## Talks

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- Device-level File Systems, Aug. 2018, Longmont Colorado, Seagate Technology.
- Persistent Memory Key Value Store, Oct. 2018, Durham, North Carolina, NetApp Inc
- Device-level File Systems, FAST, Feb. 2018, Oakland.
- Designing Operating Systems for Heterogeneous Systems, Feb. 2018 - April 2018, University of Arizona, North Carolina State University, University of Waterloo, Penn State University, George Washington University, University of California, Santa Barbara, University of Oregon, University of Virginia, Rutgers University, University of California, Santa Cruz, University of Massachusetts - Amherst, University of Minnesota - Twin Cities, Stony Brook University
- OS design for Heterogeneous Memory Management in Datacenter, ISCA June 2017, Toronto.
- Reducing Energy Overheads of Memory-based Persistence in NVMs, PACT, Sep. 2016, Haifa.
- Persistent Virtual Memory for Capacity Scaling and Object Storage, Eurosys, Mar. 2016, London.
- Heterogeneous Memory Management, Univ. of Wisconsin-Madison, May 2016, Madison.
- Energy Aware Persistence, NVMW, March 2016, Univ. of Sand Diego, Sand Diego.
- Reducing the Cost of Persistence for Nonvolatile Heaps, HPCA, Feb. 2014, Orlando.
- NVM for Rich Client Services, Intel Labs, Aug 2013, Hillsboro, Oregon.
- Optimizing Checkpoints Using NVM as Virtual Memory, IPDPS, June 2013, Boston.
- NVM Heaps for Accelerating Browser-based Applications, INFLOW (SOSP Workshop), Nov. 2013, Pennsylvania.
- Using Active NVRAM for I/O Staging, PDAC, Nov. 2011 (SC Workshop), Seattle.
- Active NVRAM for in-memory processing, HP Labs, Aug. 2011, Palo Alto.
- Cloud4Home – Enhancing Data Services with @Home Clouds, ICDCS, June 2011, Minneapolis.

## References

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Prof. Ada Gavrilovska  
College of Computing  
Georgia Institute of Technology  
ada@cc.gatech.edu

Prof. Remzi Arpaci-Dassaeu  
Department of Computer Sciences  
University of Wisconsin-Madison  
remzi@cs.wisc.edu

Prof. Andrea Arpaci-Dassaeu  
Department of Computer Sciences  
University of Wisconsin-Madison  
dusseau@cs.wisc.edu

Dr. Dejan Milojicic  
Distinguished Technologist  
Hewlett Packard Labs  
Palo Alto, California  
dejan.milojicic@hp.com

Prof. Thu Nguyen  
Dean of Mathematical and Physical Sciences  
Rutgers University, New Brunswick  
tdnguyen@cs.rutgers.edu