ACM SOSP 2019

The 27th ACM Symposium on Operating Systems Principles

Program Guide

Deerhurst Resort,
Huntsville, Ontario, Canada
October 27 - 30, 2019

Welcome

Welcome to the 27th ACM Symposium on Operating Systems Principles! As the flagship conference of ACM SIGOPS, SOSP brings together the leading researchers and practitioners interested in the design, implementation, and evaluation of computer systems software. We are delighted to host SOSP 2019 at the Deerhurst Resort, and are glad that you could be here with us. We hope that you enjoy the conference!

SOSP 2019 Organizing Committee

Logistical Information

WiFi

The Deerhurst Resort provides high-speed Wireless Internet service, which is included in your resort fee. In the meeting spaces, please use sosp2019 as the network ID and password.

Badges

Please wear your name badge for all SOSP activities, including meals, breaks, and technical sessions.

Volunteers

The SOSP student volunteers are wearing blue shirts. Please let them know if you have any problems.

Restrooms

The closest (and largest) restrooms are by the conference centre entrance, with others near the Compass Restaurant, or upstairs near Sunday's workshop/tutorial rooms. The restrooms near the Peninsula Room elevator have been designated as gender-neutral during SOSP. All restrooms are wheelchair-accessible.

Talks

Each conference paper is allocated a 20-minute slot, structured as a 16-minute talk plus 4 minutes for questions. Speakers should find their session chair and test their laptop prior to the session in which they are presenting. When asking questions, please use the microphones if possible.

Posters

The poster session is on Monday from 5:00 PM to 7:30 PM in the Waterhouse and/or Peninsula Rooms. It features 38 conference papers plus 14 posters from the Student Research Competition (SRC). Poster presenters should set up their posters one hour before the poster session. Ask the student volunteers if you need any help with this. All posters are numbered as indicated in this Program Guide.

Sponsors

Please make sure to visit the sponsor tables in the foyer near the SOSP Registration Desk. You can see their demos, collect some swag items, and thank them for their generous support of SOSP.

Special Meals

For those with (pre-arranged) special meal requests based on dietary restrictions, please ask Carey, Deb, or your serving staff for instructions on how to obtain your food at meal times.

Shuttle

The Deerhurst Resort offers basic shuttle service between buildings on the resort property. The shuttle operates on a loop stopping at each buildings every 10-15 minutes. You can also call '0' from your room or any house phone to request a shuttle.

SOSP Bus

SOSP thanks the Vector Institute for their generous support of the bus transportation program. The return buses from Deerhurst to Toronto Pearson International Airport (YYZ) are scheduled for departure on Wednesday at 3:00 PM and Thursday at 10:00 AM. Please use EventBrite to reserve a seat if you need one (and haven't already done so). The Billy Bishop Toronto City (YTZ) airport can be reached from YYZ using local public transportation. Details available upon request.

Conference at a Glance

Monday, Oct 28	7:30 AM - 8:45 AM	Breakfast	Waterhouse / Peninsula
	8:45 AM - 9:00 AM	Welcome and Opening Remarks	Legacy Hall
	9:00 AM - 10:20 AM	Session 1: Machines, Learning	Legacy Hall
		AM Break	
	10:50 AM - 11:50 AM	Session 2: It Must Be Secure	Legacy Hall
	11:50 AM - 1:40 PM	Lunch	Waterhouse / Peninsula
	1:40 PM - 3:00 PM	Session 3: Systems: Still Buggy	Legacy Hall
		PM Break	
	3:30 PM - 4:30 PM	Session 4: Keeping Things Private	Legacy Hall
	5:00 PM - 7:30 PM	Poster Session (Conference Papers and SRC)	Waterhouse / Peninsula
	5:00 PM - 7:30 PM	Reception (Pub Style Food Stations)	Waterhouse / Peninsula
Tuesday, Oct 29	7:30 AM - 9:00 AM	Breakfast	Waterhouse / Peninsula
	9:00 AM - 10:20 AM	Session 5: It Must Be Correct	Legacy Hall
		AM Break	
	10:50 AM - 11:50 AM	Session 6: Data, Data, Everywhere	Legacy Hall
	11:50 AM - 1:40 PM	Lunch	Waterhouse / Peninsula
	1:40 PM - 3:00 PM	Session 7: The Revolution Will Be Distributed	Legacy Hall
	3:30 PM - 4:30 PM	Session 8: Net Work	Legacy Hall
		PM Break	
	5:00 PM - 6:30 PM	SRC Presentations	Tom Thomson Room
	7:00 PM - 9:00 PM	Banquet and Awards	Legacy Hall
	9:00 PM - 10:00 PM	ACM SIGOPS Business Meeting	Legacy Hall
Wednesday, Oct 30	7:30 AM - 9:00 AM	Breakfast	Waterhouse / Peninsula
	9:00 AM - 10:20 AM	Session 9: The Persistence Of Memory	Legacy Hall
		AM Break	
	10:50 AM - 11:50 AM	Session 10: Making Things Faster	Legacy Hall
	11:50 AM - 1:40 PM	Lunch	Waterhouse / Peninsula
	1:40 PM - 2:40 PM	Session 11: The Final Session	Legacy Hall
	2:40 PM	Closing Remarks	Legacy Hall

Monday, October 28 — Morning

7:30 AM - 8:45 AM	Breakfast	Waterhouse / Peninsula

8:45 AM - 9:00 AM	Welcome and Opening Remarks	Legacy Hall

- General Chairs:
  Tim Brecht (*University of Waterloo*)
  Carey Williamson (*University of Calgary*)
- PC Chairs:
  Remzi H. Arpaci-Dusseau (*University of Wisconsin*)
  Yuanyuan Zhou (*University of California San Diego*)

9:00 AM - 10:20 AM	Session 1: Machines, Learning	Legacy Hall

Session Chair: Vijay Chidambaram *(University of Texas Austin and VMware Research)*

1. PipeDream: Generalized Pipeline Parallelism for DNN Training
   Deepak Narayanan *(Stanford University)*; Aaron Harlap *(CMU)*; Amar Phanishayee, Vivek Seshadri, Nikhil R. Devanur *(Microsoft Research)*; Gregory R. Ganger, Phillip B. Gibbons *(Carnegie Mellon University)*; Matei Zaharia *(Stanford University)*

2. A Generic Communication Scheduler for Distributed DNN Training Acceleration
   Yanghua Peng *(The University of Hong Kong)*; Yibo Zhu *(ByteDance Inc.)*; Yangrui Chen, Yixin Bao *(The University of Hong Kong)*; Bairen Yi, Chang Lan *(ByteDance Inc.)*; Chuan Wu *(The University of Hong Kong)*; Chuanxiong Guo *(ByteDance Inc.)*

3. Parity Models: Erasure-Coded Resilience for Prediction Serving Systems
   Jack Kosaian, K. V. Rashmi *(Carnegie Mellon University);* Shivaram Venkataraman *(University of Wisconsin-Madison)*

4. TASO: Optimizing Deep Learning Computation with Automated Generation of Graph Substitutions
   Zhihao Jia, Oded Padon, James Thomas, Todd Warszawski, Matei Zaharia, Alex Aiken *(Stanford Univeristy)*

10:20 AM - 10:50 AM	Break	Rotunda / Hallway

10:50 AM - 11:50 AM	Session 2: It Must Be Secure	Legacy Hall

Session Chair: Taesoo Kim *(Georgia Tech and Samsung Research)*

5. Teechain: A Secure Payment Network with Asynchronous Blockchain Access
   Joshua Lind *(Imperial College London)*; Oded Naor, Ittay Eyal *(Technion)*; Florian Kelbert *(Imperial College London)*; Emin Gun Sirer *(Cornell University)*; Peter Pietzuch *(Imperial College London)*

6. Fast and Secure Global Payments with Stellar
   Marta Lokhava *(Stellar)*; Giuliano Losa *(Galois, Inc.)*; David Mazières, Graydon Hoare, Nicolas Barry *(Stellar)*; Eliezer Gafni *(UCLA)*; Jonathan Jove, Rafał Malinowski, Jed McCaleb *(Stellar)*

7. Notary: A Device for Secure Transaction Approval
   Anish Athalye, Adam Belay, Frans Kaashoek, Robert Morris, Nickolai Zeldovich *(MIT CSAIL)*

11:50 AM - 1:40 PM	Lunch	Waterhouse / Peninsula

Monday, October 28 — Afternoon

1:40 PM - 3:00 PM	Session 3: Systems: Still Buggy	Legacy Hall

Session Chair: Baris Kasikci *(University of Michigan)*

8. CrashTuner: Detecting Crash Recovery Bugs in Cloud Systems via Meta-info Analysis
   Jie Lu, Chen Liu, Lian Li, Xiaobing Feng *(The Institute of Computing Technology of the Chinese Academy of Sciences)*; Feng Tan, Jun Yang, Liang You *(Alibaba Group)*

9. The Inflection Point Hypothesis: A Principled Debugging Approach for Locating the Root Cause of a Failure
   Yongle Zhang, Kirk Rodrigues, Yu Luo, Michael Stumm, Ding Yuan *(University of Toronto)*

10. Finding Semantic Bugs in File Systems with an Extensible Fuzzing Framework
    Seulbae Kim, Meng Xu, Sanidhya Kashyap, Jungyeon Yoon, Wen Xu, Taesoo Kim *(Georgia Institute of Technology)*

11. Efficient and Scalable Thread-Safety Violation Detection --- Finding thousands of concurrency bugs during testing
    Guangpu Li, Shan Lu *(University of Chicago)*; Madanlal Musuvathi, Suman Nath *(Microsoft Research)*; Rohan Padhye *(University of California, Berkeley)*

3:00 PM - 3:30 PM	Break	Rotunda / Hallway

3:30 PM - 4:30 PM	Session 4: Keeping Things Private	Legacy Hall

Session Chair: Brad Karp *(University of College London)*

12. Privacy Accounting and Quality Control in the Sage Differentially Private ML Platform
    Mathias Lecuyer, Riley Spahn, Kiran Vodrahalli, Roxana Geambasu, Daniel Hsu *(Columbia University)*

13. Honeycrisp: Large-scale Differentially Private Aggregation Without a Trusted Core
    Edo Roth, Daniel Noble, Brett Hemenway Falk, Andreas Haeberlen *(University of Pennsylvania)*

14. Yodel: Strong Metadata Security for Voice Calls
    David Lazar, Yossi Gilad, Nickolai Zeldovich *(MIT CSAIL)*

5:00 PM - 7:30 PM	Conference Papers Poster Session	Waterhouse / Peninsula

5:00 PM - 7:30 PM	SRC Poster Session	Waterhouse / Peninsula

5:00 PM - 7:30 PM	Reception (Pub Style Food Stations)	Waterhouse / Peninsula

Tuesday, October 29 — Morning

7:30 AM – 9:00 AM	Breakfast	Waterhouse / Peninsula

9:00 AM - 10:20 AM	Session 5: It Must Be Correct	Legacy Hall

Session Chair: Junfeng Yang *(Columbia University)*

15. Scaling Symbolic Evaluation for Automated Verification of Systems Code with Serval
    Luke Nelson, James Bornholt *(University of Washington)*; Ronghui Gu *(Columbia University)*; Andrew Baumann *(Microsoft Research)*; Emina Torlak, Xi Wang *(University of Washington)*

16. Verifying Concurrent, Crash-Safe Systems with Perennial
    Tej Chajed *(MIT CSAIL)*; Joseph Tassarotti *(Boston College)*; Frans Kaashoek, Nickolai Zeldovich *(MIT CSAIL)*

17. Using Concurrent Relational Logic with Helpers for Verifying the AtomFS File System
    Mo Zou, Haoran Ding, Dong Du *(Institute of Parallel and Distributed Systems, Shanghai Jiao Tong University)*; Ming Fu *(Huawei Technologies Co. Ltd)*; Ronghui Gu *(Columbia University)*; Haibo Chen *(Institute of Parallel and Distributed Systems, Shanghai Jiao Tong University)*

18. Verifying Software Network Functions with No Verification Expertise
    Arseniy Zaostrovnykh, Solal Pirelli, Rishabh Iyer, Matteo Rizzo, Luis Pedrosa, Katerina Argyraki, George Candea *(EPFL)*

10:20 AM - 10:50 AM	Break	Rotunda / Hallway

10:50 AM - 11:50 AM	Session 6: Data, Data, Everywhere	Legacy Hall

Session Chair: Shivaram Venkataraman *(University of Wisconsin-Madison)*

19. Optimizing Data-Intensive Computations in Existing Libraries with Split Annotations
    Shoumik Palkar, Matei Zaharia *(Stanford University)*

20. Niijima: Sound and Automated Computation Consolidation for Efficient Multilingual Data-Parallel Pipelines
    Guoqing Harry Xu *(UCLA)*; Margus Veanes, Michael Barnett, Madan Musuvathi, Todd Mytkowicz, Ben Zorn *(Microsoft Research)*; Huan He, Haibo Lin *(Microsoft)*

21. Nexus: A GPU Cluster Engine for Accelerating DNN-Based Video Analysis
    Haichen Shen *(Amazon Web Services)*; Lequn Chen, Yuchen Jin, Liangyu Zhao *(University of Washington)*; Bingyu Kong *(Shanghai Jiao Tong University)*; Matthai Philipose *(Microsoft Research)*; Arvind Krishnamurthy *(University of Washington)*; Ravi Sundaram *(Northeastern University)*

11:50 AM - 1:40 PM	Lunch	Waterhouse / Peninsula

Tuesday, October 29 — Afternoon

1:40 PM - 3:00 PM	Session 7: The Revolution Will Be Distributed	Legacy Hall

Session Chair: Atul Adya *(Google)*

22. Lineage Stash: Fault Tolerance Off the Critical Path
Stephanie Wang *(UC Berkeley)*; John Liagouris *(ETH Zurich)*; Robert Nishihara, Philipp Moritz *(UC Berkeley);* Ujval Misra *(UC Berkeley, Dropbox)*; Alexey Tumanov, Ion Stoica *(UC Berkeley)*

23. File Systems Unfit as Distributed Storage Backends: Lessons from 10 Years of Ceph Evolution
Abutalib Aghayev *(Carnegie Mellon University)*; Sage Weil *(Red Hat Inc.)*; Michael Kuchnik *(Carnegie Mellon University)*; Mark Nelson *(Red Hat Inc.)*; Gregory R. Ganger, George Amvrosiadis *(Carnegie Mellon University)*

24. I4: Incremental Inference of Inductive Invariants for Verification of Distributed Protocols
Haojun Ma, Aman Goel, Jean-Baptiste Jeannin, Manos Kapritsos, Baris Kasikci, Karem A. Sakallah *(University of Michigan)*

25. Aegean: Replication Beyond the Client-Server Model
Remzi Can Aksoy, Manos Kapritsos *(University of Michigan)*

3:00 PM - 3:30 PM	Break	Rotunda / Hallway

3:30 PM - 4:30 PM	Session 8: Net Work	Legacy Hall

Session Chair: Rebecca Isaacs *(Twitter)*

26. Snap: a Microkernel Approach to Host Networking
Michael Marty, Marc de Kruijf, Jacob Adriaens, Christopher Alfeld, Sean Bauer, Carlo Contavalli, Michael Dalton, Nandita Dukkipati, William C. Evans, Steve Gribble, Nicholas Kidd, Roman Kononov, Gautam Kumar, Carl Mauer, Emily Musick, Lena Olson, Erik Rubow, Michael Ryan, Kevin Springborn, Paul Turner, Valas Valancius, Xi Wang, Amin Vahdat *(Google, Inc.)*

27. Risk-based Planning for Evolving Data-Center Networks
Omid Alipourfard *(Yale University)*; Jiaqi Gao *(Harvard University)*; Jeremie Koenig, Chris Harshaw *(Yale University)*; Amin Vahdat *(Google)*; Minlan Yu *(Harvard University)*

28. Taiji: Managing Global User Traffic for Large-Scale Internet Services at the Edge
David Chou *(Facebook, Inc.)*; Tianyin Xu *(UIUC and Facebook, Inc.)*; Kaushik Veeraraghavan, Andrew Newell, Sonia Margulis, Lin Xiao, Pol Mauri Ruiz, Justin Meza, Kiryong Ha, Shruti Padmanabha, Kevin Cole, Dmitri Perelman *(Facebook, Inc.)*

5:00 PM - 6:30 PM	SRC Presentations	Tom Thomson Room

7:00 PM - 9:00 PM	Banquet and Awards	Legacy Hall

9:00 PM - 10:00 PM	ACM SIGOPS Business Meeting	Legacy Hall

Wednesday, October 30 — Morning

7:30 AM - 9:00 AM	Breakfast	Waterhouse / Peninsula

9:00 AM - 10:20 AM — Session 9: The Persistence Of Memory — Legacy Hall

Session Chair: Tianyin Xu *(UIUC)*

29. KVell: the Design and Implementation of a Fast Persistent Key-Value Store
Baptiste Lepers, Oana Balmau *(University of Sydney)*; Karan Gupta *(Nutanix Inc.)*; Willy Zwaenepoel *(University of Sydney and EPFL)*

30. RECIPE : Converting Concurrent DRAM Indexes to Persistent-Memory Indexes
Se Kwon Lee, Jayashree Mohan *(University of Texas at Austin)*; Sanidhya Kashyap, Taesoo Kim *(Georgia Institute of Technology)*; Vijay Chidambaram *(University of Texas at Austin and VMware Research)*

31. Performance and Protection in the ZoFS User-space NVM File System
Mingkai Dong, Heng Bu, Jifei Yi, Benchao Dong, Haibo Chen *(Institute of Parallel and Distributed Systems, Shanghai Jiao Tong University)*

32. SplitFS: Reducing Software Overhead in File Systems for Persistent Memory
Rohan Kadekodi, Se Kwon Lee *(University of Texas at Austin)*; Sanidhya Kashyap, Taesoo Kim *(Georgia Institute of Technology)*; Aasheesh Kolli *(Penn State University and VMware Research)*; Vijay Chidambaram *(University of Texas at Austin and VMware Research)*

10:20 AM - 10:50 AM	Break	Rotunda / Hallway

10:50 AM - 11:50 AM — Session 10: Making Things Faster — Legacy Hall

Session Chair: Don Porter *(UNC)*

33. AutoMine: Harmonizing High-Level Abstraction and High Performance for Graph Mining
Daniel Mawhirter, Bo Wu *(Colorado School of Mines)*

34. KnightKing: A Fast Distributed Graph Random Walk Engine
Ke Yang *(Tsinghua University)*; MingXing Zhang *(Graduate School at Shenzhen, Tsinghua University)*; Kang Chen *(Tsinghua University)*; Xiaosong Ma *(Qatar Computing Research Institute, HBKU)*; Yang Bai *(4Paradigm Co. Ltd.)*; Yong Jiang *(Graduate School at Shenzhen, Tsinghua University)*

35. Gerenuk: Thin Computation over Big Native Data Using Speculative Program Transformation
Christian Navasca, Cheng Cai, Khanh Nguyen *(UCLA);* Brian Demsky *(UC Irvine)*; Shan Lu *(University of Chicago)*; Miryung Kim, Guoqing Harry Xu *(UCLA)*

11:50 AM - 1:40 PM	Lunch	Waterhouse / Peninsula

Wednesday, October 30 — Afternoon

1:40 PM - 2:40 PM	Session 11: The Final Session	Legacy Hall

Session Chair: Gernot Heiser *(UNSW and Data61)*

36. An Analysis of Performance Evolution of Linux's Core Operations
Xiang (Jenny) Ren, Kirk Rodrigues, Luyuan Chen, Camilo Vega, Michael Stumm, Ding Yuan *(University of Toronto)*

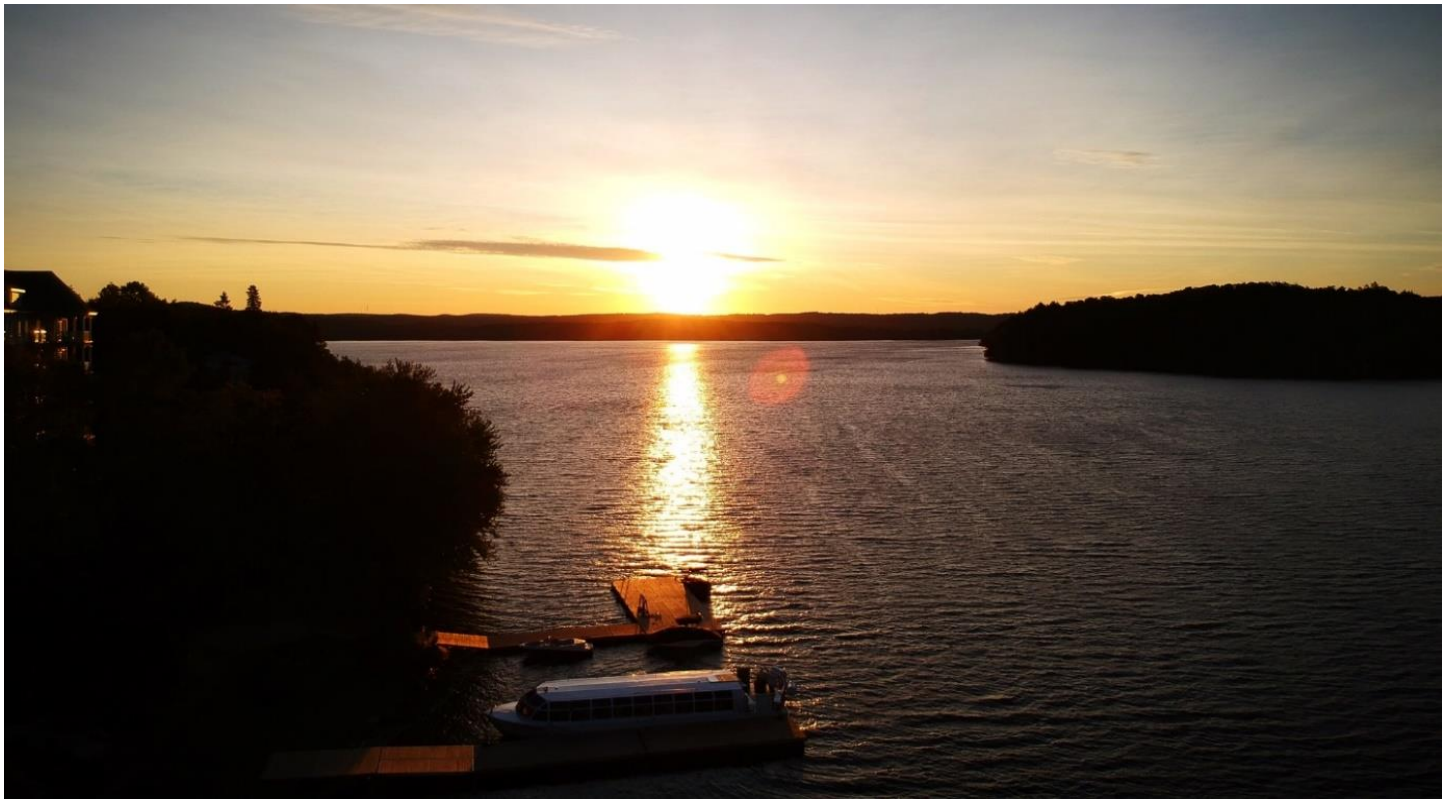
37. ShortCut: Accelerating Mostly-Deterministic Code Regions
Xianzheng Dou, Peter M. Chen, Jason Flinn *(University of Michigan)*

38. Scalable and Practical Locking with Shuffling
Sanidhya Kashyap *(Georgia Institute of Technology)*; Irina Calciu *(VMware Research Group)*; Xiaohe Cheng *(Hong Kong University of Science and Technology)*; Changwoo Min *(Virginia Tech)*; Taesoo Kim *(Georgia Institute of Technology)*

2:40 PM	Closing Remarks	Legacy Hall

Reminders:

- Hotel Checkout Time: 11:00 AM
- Travel Time to YYZ Airport: Approximately 2h 15m
- Wednesday Shuttle Bus to YYZ Airport: 3:00 PM
- Thursday Shuttle Bus to YYZ Airport: 10:00 AM



Undergraduate

SRC 1. EnergyTimers: Integrating Physical Energy Measurement Devices into Operating System Kernels
Luis Gerhorst (*Friedrich–Alexander University Erlangen–Nürnberg*)

SRC 2. Visualizing Critical Sections in Rust
Ziyi Zhang (*University of Science and Technology of China*)

Graduate

SRC 3. Accelerating File System Checking for Modern Storage
David Domingo (*Rutgers University*)

SRC 4. Wave: A Substrate for Distributed Incremental Graph Processing on Commodity Clusters
Swapnil Gandhi (*Indian Institute of Science*)

SRC 5. On Main-Memory Multicore Transaction Performance
Yihe Huang (*Harvard*)

SRC 6. Reclaiming good transactions from a corrupt Journal
Shehbaz Jaffer (*University of Toronto*)

SRC 7. DNN Training Performance Analysis: A Divide and Conquer Approach
Anand Jayarajan (*University of British Columbia*)

SRC 8. GizmoScope: A System for Performance and Reliability-aware Automated Recovery
Saurabh Jha (*University of Illinois at Urbana-Champaign*)

SRC 9. Scaling an Operating System to Many Cores Using a System Call Log
Chinmay Kulkarni (*University of Utah*)

SRC 10. Viva: Make Confidential Cloud Computing FaaSter
Mingyu Li (*Shanghai Jiao Tong University*)

SRC 11. ParaFS: Supporting Concurrency with Direct Access File Systems
Yujie Ren (*Rutgers University*)

SRC 12. Robustly Improving Byte Miss Ratio with Workload-Learning Caching
Zhenyu Song (*Princeton University*)

SRC 13. Efficient Privacy Policies in Multiverse Databases
Samyukta Yagati (*MIT CSAIL*)

SRC 14. Scalable Fault Tolerance for High-Performance Streaming Dataflow
Gina Yuan (*MIT CSAIL*)

Pavilion Building Map

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