

# Joseph Devietti

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## Education

**University of Washington, 2012**

PhD in Computer Science and Engineering, advised by [Luis Ceze](#) and [Dan Grossman](#)

**University of Washington, 2009**

Master of Science in Computer Science and Engineering

**University of Pennsylvania, 2006**

Bachelor of Science in Engineering degree in Computer Science and Bachelor of Arts degree in English.  
Graduated magna cum laude.

## Employment

**University of Pennsylvania, 2020-present**

Associate Professor, Department of Computer & Information Science

**Facebook, 2020**

Software Engineer

**University of Pennsylvania, 2013-2020**

Assistant Professor, Department of Computer & Information Science

**Cloudseal, Inc, 2018-2020**

Principal Scientist & Co-founder

## Honors & Awards

- *Radhia Cousot Young Researcher Best Paper Award* at Static Analysis Symposium (SAS) 2018
- [2013 Intel Early Career Faculty Honor Program](#)
- [2011 Intel Ph.D. Fellowship](#)
- Paper selected for IEEE Micro *Top Picks in Computer Architecture from 2009*
- Paper selected for IEEE Micro *Top Picks in Computer Architecture from 2008*

## Students

- [Bhavana Mehta](#) (PhD)
- [Omar Navarro Leija](#) (PhD)
- [Kelly Shiptoski](#) (PhD)
- [Yuxuan Zhang](#) (PhD)

## Former students

- [Gautam Mohan](#) (Master's 2020. First employment: Amazon)
- [Yuanfeng Peng](#) (PhD 2019). First employment: Google
- Nicholas Renner (Master's 2019, now a PhD student at NYU)
- Nimit Singhania (PhD 2018, co-advised with [Rajeev Alur](#)). First employment: Google
- Christian DeLozier (PhD 2018). First employment: Assistant Professor at United States Naval Academy
- Kavya Lakshminarayanan (Master's 2018) First employment: Microsoft
- Richard Zang (Master's 2018) First employment: Microsoft
- Sana Kamboj (Master's 2017) First employment: Qualcomm
- Ariel Eizenberg (Master's 2016) First employment: Government of Israel
- Brooke Fugate (Master's 2015, co-advised with [André DeHon](#))
- Liang Luo (Master's 2015, then a PhD student at the University of Washington)
- Akshitha Sriraman (Master's 2015, then a PhD student at the University of Michigan)

## Publications

### Conference Papers

- *Ripple: Profile-Guided Instruction Cache Replacement for Data Center Applications*  
Tanvir Ahmed Khan, Dexin Zhang, Akshitha Sriraman, Joseph Devietti, Gilles Pokam, and  
International Symposium on Computer Architecture (*ISCA '21*), June 2021
- *I-SPY: Context-Driven Conditional Instruction Prefetching with Coalescing*  
Tanvir Ahmed Khan, Akshitha Sriraman, Joseph Devietti, Gilles Pokam, and  
ACM IEEE International Symposium on Microarchitecture (*MICRO '20*), October 2020
- *Deterministic Atomic Buffering*  
Yuan Hsi Chou, Christopher Ng, Shaylin Cattell, Jeremy Intan, Matthew Sinclair, Joseph Devietti,  
Timothy G. Rogers and Tor Aamodt  
ACM IEEE International Symposium on Microarchitecture (*MICRO '20*), October 2020
- *Reproducible Containers*  
Omar Navarro Leija, Kelly Shiptoski, Ryan Scott, Baojun Wang, Nicholas Renner, Ryan Newton and  
Joseph Devietti  
International Conference on Architectural Support for Programming Languages & Operating Systems  
(*ASPLOS '20*), March 2020

- *Hurdle: Securing Jump Instructions Against Code Reuse Attacks*  
Christian DeLozier, Kavya Lakshminarayanan, Gilles Pokam and Joseph Devietti  
International Conference on Architectural Support for Programming Languages & Operating Systems (ASPLOS '20), March 2020
- *Lazy Determinism for Faster Deterministic Multithreading*  
Timothy Merrifield, Sepideh Roghanchi, Joseph Devietti and Jakob Eriksson  
International Conference on Architectural Support for Programming Languages & Operating Systems (ASPLOS '19), April 2019
- *Block-Size Independence for GPU Programs*  
Rajeev Alur, Joseph Devietti and Nimit Singhanian  
Static Analysis Symposium (SAS '18), August 2018  
**Radhia Cousot Young Researcher Best Paper Award**
- *CURD: A Dynamic CUDA Race Detector*  
Yuanfeng Peng, Vinod Grover and Joseph Devietti  
ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI '18), June 2018
- *SlimFast: Reducing Metadata Redundancy in Sound and Complete Dynamic Data Race Detection*  
Yuanfeng Peng, Christian DeLozier, Ariel Eizenberg, William Mansky and Joseph Devietti  
IEEE International Parallel & Distributed Processing Symposium (IPDPS '18), May 2018
- *SOFRITAS: Serializable Ordering-Free Regions for Increasing Thread Atomicity Scalably*  
Christian DeLozier, Ariel Eizenberg, Brandon Lucia and Joseph Devietti  
International Conference on Architectural Support for Programming Languages & Operating Systems (ASPLOS '18), March 2018
- *Race Detection and Reachability in Nearly Series-Parallel DAGs*  
Jeremy Fineman, Kunal Agrawal, Joseph Devietti, I-Ting Angelina Lee, Robert Utterback and Changming Xu  
ACM-SIAM Symposium on Discrete Algorithms (SODA '18), January 2018
- *Monadic composition for deterministic, parallel batch processing*  
Ryan Scott, Omar Navarro Leija, Joseph Devietti and Ryan Newton  
ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA '17), October 2017

- *TMI: Thread Memory Isolation for False Sharing Repair*  
Christian DeLozier, Ariel Eizenberg, Shiliang Hu, Gilles Pokam and Joseph Devietti  
ACM IEEE International Symposium on Microarchitecture (*MICRO '17*), October 2017
- *PARSNIP: Performant Architecture for Race Safety with No Impact on Precision*  
Yuanfeng Peng, Ben Wood and Joseph Devietti  
ACM IEEE International Symposium on Microarchitecture (*MICRO '17*), October 2017
- *GPUDrano: Detecting Uncoalesced Accesses in GPU Programs*  
Rajeev Alur, Joseph Devietti, Omar Navarro Leija and Nimit Singhania  
International Conference on Computer-Aided Verification (*CAV '17*), July 2017
- *BARRACUDA: Binary-level Analysis of Runtime RAcEs in CUDA programs*  
Ariel Eizenberg, Yuanfeng Peng, Toma Pigli, William Mansky and Joseph Devietti  
ACM SIGPLAN Conference on Programming Language Design and Implementation (*PLDI '17*), June 2017
- *Remix: Online Detection and Repair of Cache Contention for the JVM*  
Ariel Eizenberg, Shiliang Hu, Gilles Pokam and Joseph Devietti  
ACM SIGPLAN Conference on Programming Language Design and Implementation (*PLDI '16*), June 2016
- *LASER: Light, Accurate Sharing dEtection and Repair*  
Liang Luo, Akshitha Sriraman, Brooke Fugate, Shiliang Hu, Gilles Pokam, Chris Newburn and Joseph Devietti  
IEEE International Symposium on High Performance Computer Architecture (*HPCA '16*), March 2016
- *Co-Design of Anytime Computation and Robust Control*  
Yash Pant, Kartik Mohta, Houssam Abbas, Truong X. Nghiem, Joseph Devietti and Rahul Mangharam  
IEEE Real-Time Systems Symposium (*RTSS '15*), December 2015
- *High-Performance Determinism with Total Store Order Consistency*  
Timothy Merrifield, Joseph Devietti and Jakob Eriksson  
European Conference on Computer Systems (*EuroSys '15*), April 2015
- *GPUDet: A Deterministic GPU Architecture*  
Hadi Jooybar, Wilson W. L. Fung, Mike O'Connor, Joseph Devietti and Tor Aamodt  
International Conference on Architectural Support for Programming Languages & Operating Systems (*ASPLOS '13*), March 2013

- *RADISH: Always-On Sound and Complete Race Detection in Software and Hardware*  
Joseph Devietti, Ben Wood, Karin Strauss, Luis Ceze, Dan Grossman and Shaz Qadeer  
International Symposium on Computer Architecture (*ISCA '12*), June 2012
- *RCDC: A Relaxed-Consistency Deterministic Computer*  
Joseph Devietti, Jacob Nelson, Tom Bergan, Luis Ceze and Dan Grossman  
International Conference on Architectural Support for Programming Languages & Operating Systems (*ASPLOS '11*), March 2011
- *CoreDet: A Compiler and Runtime System for Deterministic Multithreaded Execution*  
Tom Bergan, Owen Anderson, Joseph Devietti, Luis Ceze and Dan Grossman  
International Conference on Architectural Support for Programming Languages & Operating Systems (*ASPLOS '10*), March 2010
- *DMP: Deterministic Shared Memory Multiprocessing*  
Joseph Devietti, Brandon Lucia, Luis Ceze and Mark Oskin  
International Conference on Architectural Support for Programming Languages & Operating Systems (*ASPLOS '09*), March 2009  
**Selected for IEEE Micro Top Picks '09**
- *Atom-Aid: Surviving and Detecting Atomicity Violations*  
Brandon Lucia, Joseph Devietti, Karin Strauss and Luis Ceze  
International Symposium on Computer Architecture (*ISCA '08*), June 2008  
**Selected for IEEE Micro Top Picks '08**
- *HardBound: Architectural Support for Spatial Safety of the C Programming Language*  
Joseph Devietti, Colin Blundell, Milo Martin and Steve Zdancewic  
International Conference on Architectural Support for Programming Languages & Operating Systems (*ASPLOS '08*), March 2008
- *Making the Fast Case Common and the Uncommon Case Simple in Unbounded Transactional Memory*  
Colin Blundell, Joseph Devietti, E Christopher Lewis and Milo Martin  
International Symposium on Computer Architecture (*ISCA '07*), June 2007

## Journal Papers

- *Anytime Computation and Control for Autonomous Systems*  
Yash Pant, Houssam Abbas, Kartik Mohta, Rhudii Quaye, Truong X. Nghiem, Joseph Devietti and Rahul Mangharam  
IEEE Transactions on Control Systems Technology, March 2021

- *Monadic composition for deterministic, parallel batch processing*  
Ryan Scott, Omar Navarro Leija, Joseph Devietti and Ryan Newton  
Proceedings of the ACM on Programming Languages, alternate version of the OOPSLA 2017 paper, October 2017
- *DMP: Deterministic Shared-Memory Multiprocessing*  
Joseph Devietti, Brandon Lucia, Luis Ceze and Mark Oskin  
IEEE Micro, Vol. 30 No. 1, January 2010
- *Atom-Aid: Detecting and Surviving Atomicity Violations*  
Brandon Lucia, Joseph Devietti, Luis Ceze and Karin Strauss  
IEEE Micro, Vol. 29 No. 1, January 2009

## Workshop Papers

- *Verifying Dynamic Race Detection*  
William Mansky, Yuanfeng Peng, Steve Zdancewic and Joseph Devietti  
Certified Programs and Proofs (*CPP '17*), co-located with POPL 2017, January 2017
- *MAMA: Mostly Automatic Management of Atomicity*  
Christian DeLozier, Joseph Devietti and Milo Martin  
Workshop on Determinism and Correctness in Parallel Programming (*WoDet '14*), held in conjunction with ASPLOS '14, March 2014
- *The Case For Merging Execution- and Language-level Determinism with MELD*  
Joseph Devietti, Dan Grossman and Luis Ceze  
Workshop on Determinism and Correctness in Parallel Programming (*WoDet '12*), held in conjunction with ASPLOS '12, March 2012
- *The Deterministic Execution Hammer: How Well Does it Actually Pound Nails?*  
Tom Bergan, Joseph Devietti, Nicholas Hunt and Luis Ceze  
Workshop on Determinism and Correctness in Parallel Programming (*WoDet '11*), held in conjunction with ASPLOS '11, March 2011
- *Lock Prediction*  
Brandon Lucia, Joseph Devietti, Tom Bergan, Luis Ceze and Dan Grossman  
USENIX Workshop on Hot Topics in Parallelism (*HotPar '10*), accepted for poster session, June 2010
- *The Case for System Support for Concurrency Exceptions*  
Luis Ceze, Joseph Devietti, Brandon Lucia and Shaz Qadeer  
USENIX Workshop on Hot Topics in Parallelism (*HotPar '09*), March 2009

- *Explicitly Parallel Programming with Shared-Memory is Insane: At Least Make it Deterministic!*  
Joseph Devietti, Brandon Lucia, Luis Ceze and Mark Oskin  
Workshop on Software and Hardware Challenges of Manycore Platforms (*SHCMP '08*), held in conjunction with ISCA '08, June 2008

## Posters

- *SlimFast: Reducing Metadata Redundancy in Sound & Complete Dynamic Data Race Detection*  
Yuanfeng Peng and Joseph Devietti  
PLDI Student Research Competition (*PLDI SRC '15*), held in conjunction with PLDI '15, June 2015

## Technical Reports

- *Code-Centric Communication Graphs for Shared-Memory Multithreaded Programs*  
Ben Wood, Joseph Devietti, Luis Ceze and Dan Grossman  
Technical Report UW-CSE-09-05-02, May 2009

## Dissertation

- *Deterministic Execution for Arbitrary Multithreaded Programs*  
Joseph Devietti  
PhD Dissertation, University of Washington, November 2012

## Current Funding

- Google Research Award: Airtight Reproducible Builds in Bazel. \$49,976, 2019. (Co-PI with PI [Ryan Newton](#))
- NSF 1703541: CSR: SHF: Medium: Collaborative Research: New Horizons in Deterministic Execution. \$850,000, 2017-2019. (PI with co-PI [Jakob Eriksson](#))
- Intel: Leveraging Intel Platforms to Understand and Optimize Full-System Caching Behavior. \$225,000, 2016-2019. (PI)
- NSF 1525296: SHF: SMALL: LUCID: Low-overhead, Unobtrusive Cache Contention Detection and Repair. \$480,000, 2015-2018. (PI)

## Past Funding

- NSF XPS-1337174: CLCCA: Improving Parallel Program Reliability Through Novel Approaches to Precise Dynamic Data Race Detection. \$700,000, 2013-2017. (PI with co-PIs [Stephan Zdancewic](#) and [Milo Martin](#))
- Intel Early Career Faculty Award. 2013. \$40,000.

## Invited Talks

- *Feedback-Driven Processors*  
ASPLOS PC Workshop, University of Washington, 14 November 2019  
[\[abstract\]](#)
- *Feedback-Driven Processors*  
UIUC, 28 October 2019  
[\[abstract\]](#)
- *Feedback-Driven Processors*  
University of Michigan, 25 September 2019  
[\[abstract\]](#) [\[web\]](#)
- *Feedback-Driven Processors*  
MIT, 23 September 2019  
[\[abstract\]](#)
- *Leveraging Intel Platforms for Automatic Cache Contention Detection and Repair*  
Intel Labs, 16 May 2018  
[\[abstract\]](#)
- *Automatically Finding & Fixing Cache Contention Bugs*  
Washington University in St. Louis, 18 November 2016  
[\[abstract\]](#)
- *Automatically Finding & Fixing Cache Contention Bugs*  
Carnegie Mellon University, 20 September 2016  
[\[abstract\]](#)
- *Towards Automatic Synchronization of Parallel Programs*  
Qualcomm Research, San Diego, 13 March 2015  
[\[abstract\]](#)
- *Low-overhead, Unobtrusive Cache Contention Detection and Repair*  
Intel Labs, Santa Clara, 6 February 2015  
[\[abstract\]](#)
- *Towards Automatic Synchronization of Parallel Programs*  
Intel Labs, Santa Clara, 7 February 2014  
[\[abstract\]](#)
- *No Such Thing as Luck: Improving Parallel Programming with Determinism*  
Rutgers University, 3 December 2013



- *No Such Thing as Luck: Improving Parallel Programmability with Determinism*  
Microsoft Research, Redmond, 23 April 2012  
[\[abstract\]](#) [\[video\]](#)
- *No Such Thing as Luck: Improving Parallel Programmability with Determinism*  
Penn State, Computer Science & Engineering, 18 April 2012  
[\[abstract\]](#)

## Professional Activities

### Organizer

- Co-organizer of the 5th Workshop on Determinism and Correctness in Parallel Programming ([WoDet 2014](#)), co-located with ASPLOS 2014
- Co-organizer of the 4th Workshop on Determinism and Correctness in Parallel Programming ([WoDet 2013](#)), co-located with ASPLOS 2013
- Co-organizer of the 3rd Workshop on Systems for Future Multicore Architectures ([SFMA 2013](#)), co-located with EuroSys 2013

### Conference Program Committees

- International Conference on Architectural Support for Programming Languages & Operating Systems (*ASPLOS*) 2016, 2019, 2020, 2022
- ACM SIGPLAN Conference on Programming Language Design and Implementation (*PLDI*) 2017, 2021
- ACM IEEE International Symposium on Microarchitecture (*MICRO*) 2020
- International Symposium on Code Generation and Optimization (*CGO*) 2017
- IEEE International Symposium on High Performance Computer Architecture (*HPCA*) 2013, 2014, 2016
- IEEE Micro's Top Picks from the Computer Architecture Conferences (*IEEE Micro Top Picks*) 2016

### Conference / Journal Reviewer

- ACM IEEE International Symposium on Microarchitecture (*MICRO*) 2013-2017, 2021
- International Symposium on Computer Architecture (*ISCA*) 2008, 2013-2015, 2020
- IEEE International Symposium on Performance Analysis of Systems and Software (*ISPASS*) 2020
- IEEE Transactions on Very Large Scale Integration Systems (*TVLSI*) 2020
- IEEE International Symposium on High Performance Computer Architecture (*HPCA*) 2017, 2019
- International Symposium on Memory Management (*ISMM*) 2018
- PLOS ONE (*PLOS ONE*) 2018
- IEEE Transactions on Computers (*TC*) 2013, 2018
- International Conference on Architectural Support for Programming Languages & Operating Systems (*ASPLOS*) 2010-2012, 2017
- European Conference on Object-Oriented Programming (*ECOOP*) 2017
- ACM Transactions on Parallel Computing (*TOPC*) 2014, 2017
- ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (*PPoPP*) 2012, 2016

- ACM Transactions on Architecture and Code Optimization (*TACO*) 2012-2016
- IEEE Computer Architecture Letters (*CAL*) 2013, 2015
- ACM SIGPLAN Conference on Programming Language Design and Implementation (*PLDI*) 2011, 2012, 2015
- Transactions on Computer-Aided Design of Integrated Circuits and Systems (*TCAD*) 2015
- Elsevier Science of Computer Programming (*SCP*) 2015
- ACM Transactions on Computer Systems (*TOCS*) 2015
- International Symposium on Code Generation and Optimization (*CGO*) 2014
- International Conference on Parallel Architectures and Compilation Techniques (*PACT*) 2014
- ACM Transactions on Programming Languages and Systems (*TOPLAS*) 2013
- IEEE Symposium on Security and Privacy (*Oakland*) 2011
- ACM International Conference on Supercomputing (*ICS*) 2009

## Other Reviewing

- PC member for the International Workshop on Dynamic Analysis (*WODA 2014*), held in conjunction with ISSTA 2014
- PC member for the Workshop on Systems for Future Multicore Architectures ([SFMA 2014](#)), held in conjunction with EuroSys 2014
- Poster Session PC member at [EuroSys 2014](#)
- Poster Session PC member at [SOSP 2013](#)
- PC member for the Workshop on Transitioning to Multicore, held in conjunction with OOPSLA 2011
- Reviewer for the ACM SIGPLAN Workshop on Memory Systems Performance and Correctness (*MSPC*) 2011
- Reviewer for the International Symposium on Memory Management (*ISMM*) 2009

## Other Roles

- Workshop/Tutorials Co-Chair of the International Conference on Architectural Support for Programming Languages and Operating Systems ([ASPLOS 2020](#))
- Artifact Evaluation Chair of the International Symposium on Code Generation and Optimization ([CGO 2017](#))
- Treasurer & Registration Chair of the 21st IEEE Symposium on High Performance Computer Architecture ([HPCA 2015](#))

## Teaching

- CIS 700-002 (grad-level) — University of Pennsylvania — [Fall 2021](#)
- CIS 471/571 (grad-level) — University of Pennsylvania — [Spring 2021](#)
- CIS 371 (undergrad-level) — University of Pennsylvania — [Spring 2018](#), [Spring 2020](#)
- CIS 501 (grad-level) — University of Pennsylvania — [Spring 2019](#), [Fall 2019](#)
- CIS 501: Computer Architecture (grad-level) — University of Pennsylvania — [Fall 2013](#), [Spring 2015](#), [Fall 2015](#), [Fall 2016](#), [Fall 2017](#)

- CIS 601: GPGPU Programming Models (grad-level) — University of Pennsylvania — [Spring 2016](#), [Spring 2017](#)
- CIS 601: Security in Multicore Architectures (grad-level) — University of Pennsylvania — [Spring 2014](#)
- CIS 800-003: Topics in Parallel Programmability (grad-level) — University of Pennsylvania — [Spring 2013](#)
- CSE 399: Unix/Linux Skills (undergrad-level) — University of Pennsylvania — Spring 2007

## Dissertations Supervised

- Yuanfeng Peng, 2019. *Efficient Data Race Detection For CPU and GPU*
- Nimit Singhanian, 2018. *Static Analysis for Improving Performance of GPU Programs*
- Christian DeLozier, 2018. *Strong Memory Consistency for Parallel Programming*

## Patents

- Luis Ceze, Thomas Bergan, Joseph Devietti, Daniel Grossman, Jacob Nelson. "Systems and Methods for Providing Deterministic Execution." U.S. Patent No. 9,146,746 issued September 2015.
- Luis Ceze, Mark Oskin, Joseph Devietti, Brandon Lucia. "Critical path deterministic execution of multithreaded applications in a transactional memory system." U.S. Patent 8,739,163 issued May 2014.

## Startup Companies

I am a co-founder of Cloudseal, Inc, providing the world's first deterministic container environment that provides 1-click reproducibility of application errors and crashes for improved debugging and developer productivity.