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

- 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

- *Twig: Profile-Guided BTB Prefetching for Data Center Applications*
  Tanvir Ahmed Khan, Nathan Brown, Akshitha Sriraman, Niranjan K Soundararajan, Rakesh Kumar, Joseph Devietti, Sreenivas Subramoney, Gilles Pokam, and
  ACM IEEE International Symposium on Microarchitecture *(MICRO '21)*, October 2021

- *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 Singhania
  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

- *Static detection of uncoalesced accesses in GPU programs*
  Rajeev Alur, Joseph Devietti, Omar Navarro Leija and Nimit Singhania
  Formal Methods in System Design, March 2021

- *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, 2023
- ACM IEEE International Symposium on Microarchitecture *(MICRO)* 2020, 2022
- ACM SIGPLAN Conference on Programming Language Design and Implementation *(PLDI)* 2017, 2021
- 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
- IEEE Transactions on Computers *(TC)* 2013, 2018, 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
- 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)

Institutional Service

- CIS Department Undergraduate Curriculum Chair, Summer 2021 - present
- CIS Department Minicourse Co-organizer (with Swapneel Sheth), Spring 2014 - present
- University Patent Policy Working Group, November 2020 - April 2021

Teaching

- CIS 6010 (grad-level) — University of Pennsylvania — Fall 2022
- CIS 471/571 (grad-level) — University of Pennsylvania — Spring 2021, Spring 2022
- CIS 700-002 (grad-level) — University of Pennsylvania — Fall 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 Singhania, 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 was 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.