

Lindsey Kuper

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Research interests

I work on language-based approaches to building parallel and distributed software systems that are correct and efficient. The unifying principle and goal of my work is to use high-level abstractions to express software systems in a way that not only does not compromise high performance, but actually enables it.

Education

- **Indiana University**, School of Informatics and Computing, 2008–2015
 - Ph.D. Computer Science, September 2015.
Research committee: Ryan R. Newton (chair), Lawrence S. Moss, Amr Sabry, Chung-chieh Shan.
Dissertation: *Lattice-based Data Structures for Deterministic Parallel and Distributed Programming*.
 - M.S. Computer Science, May 2010.
- **Grinnell College**, 2000–2004
 - B.A. Computer Science and Music (with honors), May 2004.
- Additional coursework and summer schools:
 - [Oregon Programming Languages Summer School: Types, Logic, and Verification](#), Summer 2013.
 - [Oregon Programming Languages Summer School: Logic, Languages, Compilation, and Verification](#), Summer 2012.
 - Operating Systems, Cornell University, Summer 2010.

Employment history

- **Intel Corporation (Intel Labs)**, Santa Clara, CA
 - *Research Scientist*, Parallel Computing Lab, February 2016–present.
 - *Research Scientist*, Programming Systems Lab, September 2014–January 2016.
- **Indiana University**, Bloomington, IN
 - *Research Assistant* (with Ryan Newton), January 2012–August 2014.
 - *Associate Instructor* (with William E. Byrd), August 2011–December 2011.
 - *Research Assistant* (with Amal Ahmed), August 2010–December 2010.
 - *Associate Instructor* (with Daniel P. Friedman), January 2009–May 2010.
- **Mozilla Corporation**, Mountain View, CA
 - *Research Engineering Intern* (supervised by Brian Anderson, Niko Matsakis and Patrick Walton), May–August 2012.
 - *Research Engineering Intern* (supervised by Dave Herman), March–August 2011.
- **GammaTech, Inc.**, Ithaca, NY
 - *Software Engineering Intern* (supervised by David Melski), May–August 2010.
- **Bedford, Freeman and Worth Publishing Group**, New York, NY and Portland, OR
 - *Associate Project Manager*, July 2006–June 2008.
- **IBCTV, LLC**, Chicago, IL and Portland, OR
 - *Web Designer/Developer*, August 2004–June 2006.

Research funding

- Co-wrote (with Ryan Newton) NSF grant CCF-1218375, [Generalizing Monotonic Data Structures for Expressive, Deterministic Parallel Programming](#) (\$377,315; 8/1/2012–7/31/2015), which funded my dissertation work.

Conference publications

- Todd A. Anderson, Hai Liu, **Lindsey Kuper**, Ehsan Totoni, Jan Vitek and Tatiana Shpeisman.
[Parallelizing Julia with a non-invasive DSL](#).
In *Proceedings of the 31st European Conference on Object-Oriented Programming (ECOOP '17)*, Barcelona, Spain, June 2017.
(27/81 \approx 33% accepted.)
[Artifact](#) successfully [evaluated](#).
- **Lindsey Kuper**, Aaron Todd, Sam Tobin-Hochstadt and Ryan R. Newton.
[Taming the parallel effect zoo: extensible deterministic parallelism with LVish](#).
In *Proceedings of the 35th ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI '14)*, Edinburgh, UK, June 2014.
(52/287 \approx 18% accepted.)
Artifact successfully [evaluated](#).
- **Lindsey Kuper**, Aaron Turon, Neelakantan R. Krishnaswami and Ryan R. Newton.
[Freeze after writing: quasi-deterministic parallel programming with LVars](#).
In *Proceedings of the 41st ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL '14)*, San Diego, CA, January 2014.
(51/220 \approx 23% accepted.)

Workshop publications

- **Lindsey Kuper** and Ryan R. Newton.
[Joining forces: toward a unified account of LVars and convergent replicated data types](#).
In the *5th Workshop on Determinism and Correctness in Parallel Programming (WoDet '14)*, Salt Lake City, UT, March 2014.
- **Lindsey Kuper** and Ryan R. Newton.
[LVars: lattice-based data structures for deterministic parallelism](#).
In *Proceedings of the 2nd ACM SIGPLAN Workshop on Functional High-Performance Computing (FHPC '13)*, Boston, MA, September 2013.
- Andrew W. Keep, Michael D. Adams, **Lindsey Kuper**, William E. Byrd and Daniel P. Friedman.
[A pattern matcher for miniKanren, or, how to get into trouble with CPS macros](#).
In *Proceedings of the 2009 Scheme and Functional Programming Workshop (Scheme '09)*, Boston, MA, August 2009.

Short papers and posters

- **Lindsey Kuper**, Guy Katz, Justin Gottschlich, Kyle Julian, Clark Barrett, and Mykel J. Kochenderfer.
[Toward scalable verification for safety-critical deep networks](#).
In *SysML 2018*,
Stanford, CA, February 2018.
[Poster](#) available.
- Isaiah Weating and **Lindsey Kuper**.
[LVars for Parallel Programming](#).
Awarded third place in Indiana University Undergraduate Research Opportunities in Computing (UROC) Poster Competition, May 2013.

Technical reports and work in progress

- **Lindsey Kuper** and Ryan R. Newton.
[Deterministic threshold queries of distributed data structures.](#)
Draft, July 2014.
- **Lindsey Kuper**, Aaron Turon, Neelakantan R. Krishnaswami and Ryan R. Newton.
[Freeze after writing: quasi-deterministic parallel programming with LVars.](#) (56 pages)
Indiana University Technical Report TR710, November 2013.
- **Lindsey Kuper** and Ryan R. Newton.
[A lattice-theoretical approach to deterministic parallelism with shared state.](#) (60 pages)
Indiana University Technical Report TR702, October 2012.
- Amal Ahmed, **Lindsey Kuper**, and Jacob Matthews.
[Parametric polymorphism through run-time sealing, or, theorems for low, low prices!](#)
Draft, fall 2011.
- David Melski, David Cok, John Phillips, Scott Wisniewski, Suan Hsi Yong, Nathan Lloyd, **Lindsey Kuper**, Denis Gopan and Alexey Loginov.
[Safety in numbers.](#) (104 pages)
GammaTech, Inc. project report, November 2010.
- David C. Bender, **Lindsey Kuper**, William E. Byrd, and Daniel P. Friedman.
[Efficient representations for triangular substitutions: A comparison in miniKanren.](#)
Draft, January 2010.

Selected talks

- *Proving that safety-critical neural networks do what they're supposed to!* ([The Recurse Center, New York, NY, May 8, 2017](#))
- *A tour of ParallelAccelerator.jl: a library and compiler for high-level, high-performance scientific computing in Julia.* ([Center for Computer Research in Music and Acoustics, Stanford University, Palo Alto, CA, January 18, 2017](#); [JuliaCon 2016, Cambridge, MA, June 24, 2016](#))
- *A library and compiler for high-level, high-performance scientific computing in Julia.* ([University of California–Berkeley, Berkeley, CA, April 14, 2016](#))
- *Finding and exploiting parallelism in a productivity language for scientific computing.* ([SPLASH-I 2015, Pittsburgh, PA, October 29, 2015](#))
- *LVars for distributed programming, or, LVars and CRDTs join forces.* ([IFIP Working Group 2.8 \(Functional Programming\), Kefalonia, Greece, May 26, 2015](#))
- *LVars: lattice-based data structures for deterministic parallel and distributed programming.* ([Compose :: Conference, New York, NY, January 31, 2015](#); [The Recurse Center, New York, NY, March 24, 2014](#); [Intel Labs, Santa Clara, CA, March 21, 2014](#); [University of Utah, Salt Lake City, UT, March 4, 2014](#); [Microsoft Research, Mountain View, CA, January 27, 2014](#))
- *Joining forces: toward a unified account of LVars and convergent replicated data types.* ([WoDet 2014, Salt Lake City, UT, March 2, 2014](#))
- *Freeze after writing: quasi-deterministic parallel programming with LVars.* ([POPL 2014, San Diego, CA, January 23, 2014](#))
- *LVars: lattice-based data structures for deterministic parallelism.* ([Mozilla Corporation, Mountain View, CA, October 31, 2013](#); [RICON West 2013, San Francisco, CA, October 29, 2013](#); [FHPC 2013, Boston, MA, September 23, 2013](#); [The Recurse Center, New York, NY, June 10, 2013](#))
- *A lattice-based approach to deterministic parallelism.* ([MPI-SWS, Saarbrücken, Germany, January 30, 2013](#); [POPL 2013 student talk session, Rome, Italy, January 25, 2013](#))

- *Rust typeclasses turn trait-er.* ([Mozilla Corporation, Mountain View, CA, August 9, 2012](#))
- *Hacking the Rust object system at Mozilla.* ([Grinnell College, Grinnell, IA, April 5, 2012](#) (invited talk, hosted by the Grinnell Alumni Scholars Program))
- *Some pieces of the Rust object system: extension, overriding, and self.* ([Mozilla Corporation, Mountain View, CA, August 18, 2011](#))
- *Parametric polymorphism through run-time sealing, or, theorems for low, low prices!* ([Northeastern University, Boston, MA, February 23, 2011](#))
- *A system for testing specifications of CPU semantics, or, what I did on my summer vacation.* ([GrammaTech, Inc., Ithaca, NY, August 20, 2010](#))

Undergraduate projects advised

- Isaiah Weating, Indiana University, Spring 2013. Project title: *Parallel Programming with LVars*. Awarded third place in IU Undergraduate Research Opportunities in Computing (UROC) Poster Competition, May 2013.

Teaching

- **Associate Instructor, Indiana University**
 - Fall 2011: [CSCI H211 Introduction to Computer Science, Honors](#), taught by Will Byrd.
 - Spring 2009, Fall 2009, Spring 2010: [CSCI B521 Programming Language Principles](#) and [CSCI C311 Programming Languages](#), taught by Dan Friedman.
- **Instructor, internalDrive, Inc.**

Taught short project-based courses to middle-school and high-school students in a university setting.

 - Summer 2004 (Northwestern University): Various week-long courses on digital music editing and web design.
 - Summer 2003 (UT Austin): Various week-long courses on digital music editing, web design, and stop-motion animation.

Service

Research community service

- Steering committee member and publicity chair, [ACM SIGPLAN International Conference on Functional Programming \(ICFP\)](#), 2015–2018.
- Program co-chair, [Domain-Specific Language Design and Implementation \(DSLDI\) 2018](#).
- Program co-chair, [DSLDI 2017](#).
- General chair, [Off the Beaten Track \(OBT\) 2017](#).
- Program chair, [OBT 2016](#).
- Program committees: [Principles and Practice of Consistency for Distributed Data \(PaPoC\) 2018](#); [OOPSLA 2018](#); [ICFP 2017](#); [DSLDI 2016](#); [IFL 2015](#); [Onward! Papers 2015](#); [PaPoC 2015](#); [OBT 2015](#); [IFL 2014](#); [Haskell Symposium 2014](#).
- External review committees: [PLDI 2018](#); [ECOOP 2016](#); [POPL 2016](#).
- Panelist: National Science Foundation, Directorate for Computer & Information Science & Engineering, 2016.
- Journal reviewing: [Distributed Computing](#), 2015; [ACM Transactions on Programming Languages and Systems \(TOPLAS\)](#), 2012.
- Additional reviewing for conferences and workshops: [PODC 2016](#); [PLDI 2015](#); [ICFP 2013](#); [PPoPP 2013](#); [PLPV 2012](#).

University service

- Graduate Education Committee, Indiana University Computer Science Program, 2013–2014.
- Website and mailing list administrator, [Indiana University Programming Languages Group](#), 2010–2014.
- Officer, [Indiana University Computer Science Club](#), 2011–2013.
- Organizer, [Indiana University PL Colloquium Series](#), 2010–2012. Coordinated speakers for weekly talk series.
- Co-organizer and program committee member, [Indiana Celebration of Women in Computing \(InWIC\) 2012](#).
- President, Indiana University Computer Science Graduate Student Association, 2010–2011.
- Steering Committee member, [Indiana University Women in Informatics and Computing](#), 2010–2011.

Outreach activities

- Co-founder and co-organizer, [!!Con](#), 2014–present. !!Con is an annual independent volunteer-run conference of ten-minute talks on the joy, excitement, and surprise of computing.
- Panelist, [Young Researcher Panel](#), Programming Languages Mentoring Workshop at POPL 2016.
- Panelist, “[The Future of Programming Languages and Programmers](#)” at SPLASH 2015.
- Program committee member, [Tiny Transactions on Computer Science volume 3](#), 2015. Tiny ToCS is the premier venue for peer-reviewed computer science research of ≤ 140 characters.
- [Resident](#) at the [Recurse Center](#), New York, NY, summer 2013, fall 2013, winter 2014. The Recurse Center is a free, self-directed educational retreat for programmers.

Selected open source software contributions

- Contributor to [ParallelAccelerator.jl](#), a library and compiler for high-performance, high-level array-style programming in Julia, 2015–present.
- Contributor to [River Trail](#), a library, JIT compiler, and web browser extension to enable parallel programming in JavaScript, 2014–2015.
- Contributor to [LVish](#), the Haskell library for deterministic and quasi-deterministic parallel programming based on my dissertation work on LVars, 2013–2015.
- Contributor to the first ten releases of [the Rust programming language](#), and various pre-release versions, 2011–2014.

Awards, fellowships, and scholarships

- Travel funding awards: [PLMW 2013](#) and [PLMW 2012](#) travel awards for POPL, January 2013 and January 2012; [CRA-W Graduate Cohort Workshop](#) invitations and travel awards, March 2010 and March 2009; [Google Workshop for Women Engineers](#) invitation and travel award, January 2009.
- Indiana University [Graduate Women in Science Fellowship](#), 2008–2009.
- National Merit Scholarship, 2000–2004.