

William E. Mansky

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Education

Ph.D. in Computer Science, University of Illinois at Urbana-Champaign: May 2014
Dissertation: [Specifying and Verifying Program Transformations with PTRANS](#), under Elsa L. Gunter

A.B. in Computer Science, Princeton University: June 2008
Graduated cum laude
Senior Thesis: [Automating Separation Logic for Concurrent C Minor](#), under Andrew W. Appel

Research Interests

Programming Languages and Formal Methods: Reasoning about Concurrent Programs, Formal Models for Concurrency and Concurrent Languages, Program Verification, Low-Level Language Semantics, Compiler Verification, Interactive Theorem Proving

Research Experience

Postdoctoral Researcher, Princeton University, September 2016 – Present, with Andrew W. Appel

- Exploring verification of concurrent programs in Verifiable C.
- Developing concurrent separation logics for C low-level atomics and verifying fine-grained concurrent algorithms.
- Using separation logic to specify and verify real-world C programs.

Postdoctoral Researcher, University of Pennsylvania, August 2014 – August 2016, with Steve Zdancewic

- Assisted in the redesign of Vellvm, a formal semantics of the LLVM intermediate language.
- Investigated the specification of concurrent memory models and memory layout, and the generic design of language semantics with respect to memory model.
- Formally verified algorithms and instrumentation passes for data race detection.

Research Assistant, University of Illinois at Urbana-Champaign, May 2010 – May 2014, with Elsa L. Gunter

- Designed and developed VeriF-OPT, a Verification Framework for Optimizations and Program Transformations.
 - Developed the PTRANS specification language for transformations on parallel programs, in which transformations are described as rewrites on threaded control flow graphs with temporal logic side conditions, formalized its semantics in the Isabelle proof assistant, and wrote executable semantics for it in F#.
 - Wrote the project description for an NSF grant proposal, which was awarded as NSF Grant #1318191: SHF: Small: VeriF-OPT, a Verification Framework for Optimizations and Program Transformations.
 - Explored the problem of formalization of memory models for concurrency, and developed operational axiomatizations in Isabelle of sequential consistency and partial and total store order models.
 - Used VeriF-OPT to verify a redundant store elimination optimization on two intermediate languages under multiple memory models.
 - Generalized common specification elements and theorems across languages and memory models.
- As part of the NASA-sponsored NextGenAA group, investigated multi-agent models for airplane landing protocols.
 - Developed a formal semantics for EOFMC, a human task behavior specification language with communication, in collaboration with Ellen Bass and Matthew Bolton at the University of Virginia
 - Developed RGTL, a Rely-Guarantee Temporal Logic for describing properties of multi-agent systems that cannot be expressed by traditional logics such as ATL.
- Revised and formalized in Isabelle the semantics of TRANS, a specification language for program transformations as graph rewrites with temporal logic side conditions, which later provided the inspiration for the VeriF-OPT project.

Summer Intern, MIT Lincoln Laboratory, June – August 2011

- Explored applications of formal methods and theorem proving, and specifically Isabelle, to security problems.
 - Verified security protocols against Dolev-Yau attacker models.
 - Implemented automatic verification algorithms as Isabelle tactics, using ML-level tactic definitions.
 - Wrote specifications of protocols that could be used to generate SML, OCaml, or Haskell implementations using Isabelle's code generation facilities.

Summer Intern, DoCoMo USA Labs, June – August 2009

- Designed a domain-specific language for specifying user interfaces of software, to replace or augment informal English-language specifications, using the rewriting-based Maude language.

Senior Thesis, Princeton University, February 2007 – May 2008

- Developed tactics in the Coq proof assistant to be used in separation logic proofs for Concurrent C Minor, an intermediate language for the CompCert certified compiler, and used them to verify multithreaded Concurrent C Minor programs.

Peer-Reviewed Papers

Mansky, W., Appel, A. W., Nogin, A.: A Verified Messaging System. OOPSLA 2017.

Eizenberg, E., Peng, Y., Pigli, T., **Mansky, W.**, Devietti, J.: BARRACUDA: Binary-level Analysis of Runtime RACes in CUDA Programs. PLDI 2017.

Mansky, W., Peng, Y., Devietti, J., Zdancewic, S.: Verified Instrumentation for Data Race Detection. Presented at CPP 2017.

Mansky, W., Gunter, E. L., Griffith, D., Adams, M. D.: Specifying and Executing Optimizations for Generalized Control Flow Graphs. Science of Computer Programming, Vol. 130.

Mansky, W., Garbuzov, D., Zdancewic, S.: [An Axiomatic Specification for Sequential Memory Models](#). Presented at CAV 2015.

Kang, J., Hur, C., **Mansky, W.**, Garbuzov, D., Zdancewic, S., Vafeiadis, V.: [A Formal C Memory Model Supporting Integer-Pointer Casts](#). PLDI 2015.

Li, L., Gunter, E. L., **Mansky, W.**: [Symbolic Analysis Tools for CSP](#). ICTAC 2014, pp. 295-313.

Mansky, W., Gunter, E. L.: [A Cross-Language Framework for Verifying Compiler Optimizations](#). Presented at LOLA 2014.

Mansky, W., Gunter, E. L.: [Verifying Optimizations for Concurrent Programs](#). WPTE@RTA/TLCA 2014, pp. 15-26. Presented at WPTE 2014.

Mansky, W., Griffith, D., Gunter, E. L.: [Specifying and Executing Optimizations for Parallel Programs](#). In: GRAPHITE 2014, pp. 58-70. Presented at GRAPHITE 2014.

Mansky, W., Gunter, E. L.: [Using Locales to Define a Rely-Guarantee Temporal Logic](#). In: Interactive Theorem Proving, Lecture Notes in Computer Science, vol. 7406, pp. 299-314 (2012). Presented at ITP 2012.

Bass, E., Bolton, M., Feigh, K., Griffith, D., Gunter, E. L., **Mansky, W.**, Rushby, J.: [Toward a multi-method approach to formalizing human-automation interaction and human-human communications](#). In: Systems, Man, and Cybernetics (SMC), 2011 IEEE International Conference on. pp. 1817-1824 (2011). Presented at IEEE SMC 2011.

Mansky, W., Gunter, E. L.: [A Framework for Verification of Compiler Optimizations](#). In: Interactive Theorem Proving, Lecture Notes in Computer Science, vol. 6172, pp. 371-386 (2010). Presented at ITP 2010.

Works in Progress, Unpublished Papers, and Technical Reports

Mansky, W., Gunter, E. L.: [Verifying Optimizations with Dynamic Thread Creation](#). Unpublished.

Mansky, W., [Specifying and Verifying Program Transformations with PTRANS](#). PhD thesis, University of Illinois at Urbana-Champaign, 2014.

Mansky, W. [The PTRANS Specification Language](#). Technical Report, University of Illinois at Urbana-Champaign, 2014.

Mansky, W.: [Automating Separation Logic for Concurrent C Minor](#). Senior thesis, Princeton University (2008), under the supervision of Andrew W. Appel.

Presentations

A Verified Safe Messaging System. Foundations of Computer Security workshop, August 2017.

Verifying Concurrent C Programs. Invited talk, Carnegie Mellon University, March 20, 2017.

Reasoning about Concurrent Memory Models. Invited talk, Princeton University, October 9, 2015.

Verifying Compiler Optimizations with PTRANS. Midwest Verification Day 2013.

Teaching/Mentoring Experience

Mentor, Pennsylvania Governor's School for the Sciences, Fall 2015

- Mentored a high school senior interested in computer science and neuroscience, guiding him through the college application process.

Instructor, University of Illinois at Urbana-Champaign, Summer 2013

- Served as the only instructor for Programming Languages and Compilers, an upper-level undergraduate class that serves as an introduction to programming language theory and compiler structure, with 35 on-campus students and 15 online students.
- Delivered lectures with an emphasis on student participation. Used the Piazza discussion site to communicate with students and respond quickly to their questions and concerns. Developed assignments and exams, graded, held office hours, and supervised a TA.
- On the list of Teachers Ranked as Excellent by their Students.
- In Summer 2014, the course was run with my recorded lectures in place of an instructor, with a TA for grading and proctoring.

Teaching Assistant, University of Illinois at Urbana-Champaign, Fall 2008 – Spring 2009 and Spring 2013

- For one semester, helped to grade assignments, provide support for online students, prepare exams, and provide technical support for Formal Software Development Methods.
- For three semesters, helped to prepare slides and exams, graded assignments, and held office hours for Programming Languages and Compilers.
- For one semester, graded and served as a discussion section leader for Discrete Structures, an introductory course in mathematics and logic for computer science students.

Mentor, Promoting Undergraduate Research Experience program, August 2012 – May 2013

- Mentored two early undergraduates (a freshman and a sophomore) with interest in computer science research.
- Tutored each student in programming languages/formal methods topics of their choice and advised them as they completed self-directed research projects related to my own research – in one case, the description of several compiler optimizations in the PTRANS specification language, and in the other, the extension of the operational semantics of an LLVM-like intermediate language with constructs including arrays and switch statements.

Awards, Grants, and Fellowships

Authored NSF Grant #1318191: SHF: Small: VeriF-OPT, a Verification Framework for Optimizations and Program Transformations, awarded June 2013 in the amount of \$466,000

- Proposed to develop a framework for the formal verification of compiler optimizations, with a focus on optimizations for parallel programs, based on the PTRANS specification language.

Mavis Future Faculty Fellow, August 2013 – May 2014

- The fellowship is awarded to engineering students with an interest in academic careers, and supports the development of its recipients in research, teaching, and mentoring. Fellows participate in paper-writing and teaching development workshops, attend engineering education conferences, mentor undergraduates and/or new graduate students, and complete a capstone project.

Graduate Teacher Certificate

- Awarded by the UIUC Center for Teaching Excellence for teaching, reflecting on and discussing teaching with a consultant, and participating in teaching development activities.

Princeton Computer Science Department Senior Thesis Award co-winner, 2008

Service and Professional Memberships

Shadow Program Committee, ASPLOS 2018

- Will write (unused) reviews for 15-20 papers submitted to ASPLOS 2018.
- Will attend the PC meeting for ASPLOS 2018 to observe the paper selection process and discuss papers with PC members.

Artifact Evaluation Committee, POPL 2018

- Will help evaluate software and proofs submitted alongside accepted papers.

Program Committee, Workshop on Foundations of Computer Security (FCS 2017)

- Wrote reviews and helped select papers to be accepted to a workshop affiliated with the IEEE Computer Security Foundations Symposium (CSF).

Program Committee, Workshop on Rewriting Techniques for Program Transformations and Evaluation (WPTE 2015, 2016, 2017)

- Wrote reviews and helped select papers to be accepted to a workshop affiliated with the International Conference on Rewriting, Deduction, and Programming (RDP).

UIUC Computer Science Grad Student Council member, August 2011 – May 2013

- Helped establish a mentoring process for the qualifying exams for new Ph.D. students.
- Participated in panels about graduate student life and preparing for the qualifying exam.
- Worked with another CSGSC member to develop Frontiers of Applications in Computer Science, a seminar in which researchers from non-CS fields present their research and discuss problems in their fields that could be solved with advances in computer science with current CS graduate students. The seminar was designed to broaden students' awareness of the applications of computer science to other research areas and create possibilities for interdisciplinary research.

Member of the Association for Computing Machinery

References

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