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David Van Horn

Education

- 2009 **Ph.D.** in Computer Science, Brandeis University, Waltham, Massachusetts.
Thesis title: *The Complexity of Flow Analysis in Higher-Order Languages*
Advisor: Harry G. Mairson. Committee: Olivier Danvy, Timothy Hickey, Olin Shivers
- 2005 **M.S.** in Computer Science, University of Vermont, Burlington, Vermont.
Thesis title: *Algorithmic Trace Effect Analysis*
Advisor: Christian Skalka.
- 2003 **B.S.** in Computer Science & Information Systems, University of Vermont, Burlington, Vermont.

Professional Experience

- 2012— **Research Assistant Professor**, Northeastern University. Funded in part by DARPA Clean-slate design of Resilient Adaptive Secure Hosts (CRASH) Program and DARPA Automated Program Analysis for Cybersecurity (APAC) Program.
- 2011—2012 **Visiting Assistant Professor**, Northeastern University. Funded in part by DARPA CRASH Program.
- 2009—2011 **CRA Computing Innovation Fellow**, Northeastern University.
- 2007—2009 **Visiting Lecturer**, Northeastern University.
- 2005—2008 **Graduate Research Assistant**, Brandeis University.
Graduate Teaching Assistant, Brandeis University.
- 2003—2005 **Graduate Research Assistant**, University of Vermont, Programming Language Security Lab.
- 2002—2003 **Undergraduate Research Assistant**, University of Vermont, Knowledge and Data Engineering Group.
- 2001—2002 **Health Behavior Research Clinic**, Burlington, Vermont, USA. *Programmer*.
- 1999—2000 **IBM**, Essex Junction, Vermont, USA. *Co-op programmer* for the Distributed Server Support Department.

Grants: Awarded

- 2012 **Scalable and Precise Abstractions of Programs for Trustworthy Software**. PI. Awarded by DARPA Information Innovation Office (I20), Automated Program Analysis for Cybersecurity (APAC). Program Manager: Timothy Fraser. Selected for funding, under negotiation. Budget: \$577,000.
- 2009 **Computing Innovation Fellow**. Awarded by the Computing Research Association and Computing Community Consortium. Funded: \$267,500. Subaward of NSF grant CNS-0937060.
<http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0937060>

Grants: In Review

2012 **A Semantic Approach to Higher-Order Contract Verification.** Co-PI. NSF. Budget: \$500,000.

Publications: Journals and Selective Conferences

- 2012 **Systematic Abstraction of Abstract Machines**, with Matthew Might. To appear in the *Journal of Functional Programming*, Special Issue for ICFP 2010.
Subcubic Control Flow Analysis Algorithms, with Jan Midtgaard. To appear in *Higher-Order and Symbolic Computation*.
- 2011 **Abstracting Abstract Machines: A Systematic Approach to Higher-Order Program Analysis**, with Matthew Might. In *Communications of the ACM, Research Highlights* **54**(9), September, 2011.
A Family of Abstract Interpretations for Static Analysis of Concurrent Higher-Order Programs, In *The 18th International Static Analysis Symposium (SAS 2011)*, Venice, Italy, September, 2011. Lecture Notes in Computer Science, 6887.
- 2010 **Abstracting Abstract Machines**, with Matthew Might. In *Proceedings of the 15th ACM SIGPLAN International Conference on Functional Programming (ICFP'10)*, Baltimore, Maryland, September, 2010.
Implementing Call-By-Need on the Control Stack, with Stephen Chang and Matthias Felleisen. In *Symposium on Trends in Functional Programming (TFP'10)*, Norman, Oklahoma, May, 2010. Winner of the best student paper award.
Resolving and Exploiting the k -CFA Paradox: Illuminating Functional vs. Object-Oriented Program Analysis, with Matthew Might and Yannis Smaragdakis. In *Proceedings of the ACM SIGPLAN 2010 Conference on Programming Language Design and Implementation (PLDI'10)*, Toronto, Canada, June, 2010.
- 2008 **Deciding k CFA is complete for EXPTIME**, with Harry G. Mairson. In *Proceedings of the 13th ACM SIGPLAN International Conference on Functional Programming (ICFP'08)*, Victoria, British Columbia, Canada, September, 2008.
Flow Analysis, Linearity, and PTIME, with Harry G. Mairson. In *The 15th International Static Analysis Symposium (SAS 2008)*, Valencia, Spain, July, 2008. Lecture Notes in Computer Science, 5079.
Types and Trace Effects of Higher Order Programs, with Christian Skalka and Scott Smith. *Journal of Functional Programming* **18**(2), March, 2008.
- 2007 **Relating Complexity and Precision in Control Flow Analysis**, with Harry G. Mairson. In *Proceedings of the Twelfth ACM SIGPLAN International Conference on Functional Programming (ICFP'07)*, Freiburg, Germany, October, 2007.
- 2005 **A Type and Effect System for Flexible Abstract Interpretation of Java**, with Christian Skalka and Scott Smith. In *Proceedings of the ACM Workshop on Abstract Interpretation of Object-Oriented Languages (AIOOL'05)*, Electronic Notes in Theoretical Computer Science. Volume 131, January, 2005.

Publications: Workshops and Others

- 2012 **Abstract Reduction Semantics for Modular Higher-Order Contract Verification**, with Sam Tobin-Hochstadt. Under review.
An Analytic Framework for JavaScript, with Matthew Might. Under review.

Publications: Workshops and Others (continued)

- 2011 **Semantic Solutions to Program Analysis Problems**, with Sam Tobin-Hochstadt. In *The ACM SIGPLAN 2011 Conference on Programming Language Design and Implementation (PLDI'11)*, FIT Session, San Jose, California, June 2011.
- 2010 **Pushdown Control-Flow Analysis of Higher-Order Programs**, with Christopher Earl and Matthew Might. In *The 2010 Workshop on Scheme and Functional Programming (SFP'10)*, Montréal, Québec, Canada, August, 2010.
- 2009 **The Complexity of Flow Analysis in Higher-Order Languages**. Ph.D. dissertation, Brandeis University, August, 2009.
Purely Functional Random-Access Pairs and Lists, SRFI 101, November 2009.
<http://srfi.schemers.org/srfi-101/>
Procedure Arity Inspection, SRFI 102, November 2009.
<http://srfi.schemers.org/srfi-102/>
- 2008 **A Few Principles of Macro Design**, with David Herman. In *The ACM Workshop on Scheme and Functional Programming*, Victoria, British Columbia, Canada, September, 2008.
SRFI Libraries, SRFI 97, August 2008.
<http://srfi.schemers.org/srfi-97/>
- 2006 **Algorithmic Trace Effect Analysis**. Masters thesis, University of Vermont, May, 2006.
- 2003 **Metadata-based Generation of Statistical Cost Functions for Text Search**, with Jeff Buzas, Paul Thompson, Byung S. Lee. University of Vermont, Technical Report CS-03-14.

Publications: Books

- 2012 **Realm of Racket**, with Mathias Felleisen and “The Roquets” (a group of Northeastern undergraduates). To be published by No Starch Press.

Teaching

Courses taught (Northeastern):

Introduction to Programming and Computing I	Fall 2007–2010
Introduction to Programming and Computing I (Honors)	Fall 2009–2011
Introduction to Programming and Computing II	Spring 2008–2010, 2012
Introduction to Programming and Computing II (Honors)	Spring 2011–2012

Courses TA'd (Brandeis):

Semantics of Programming Languages	Spring 2007–2008
Structure and Interpretation of Computer Programs	Fall 2006–2007

Courses TA'd (Vermont):

Types in Programming Languages	Spring 2006
Programming Languages	Fall 2005

Service Activities

Science of Computer Programming, Referee.

Service Activities (continued)

- Higher-Order and Symbolic Computation, Referee.
ACM Computing Surveys, Referee.
ACM Transactions on Computational Logic, Referee.
ACM Transactions on Programming Languages and Systems, Referee.
- 2013 ACM SIGPLAN/SIGACT Symposium on Principles of Programming Languages (POPL), Workshop chair and ERC member.
- 2012 Symposium on Trends in Functional Programming (TFP), Program committee.
New England Programming Languages and Systems Symposium (NEPLS), Speaker selection committee.
- 2011 ACM SIGPLAN International Conference on Functional Programming (ICFP), Program committee.
NSF CISE, Panelist.
NII International Workshop on Automated Techniques for Higher-Order Program Verification, Co-organizer with C.H. Luke Ong and Naoki Kobayashi.
Scheme and Functional Programming Workshop, Program committee.
New England Programming Languages and Systems Symposium (NEPLS), Co-chair.
European Symposium on Programming Languages (ESOP), Reviewer.
- 2010 NSF CISE, Panelist.
ACM SIGPLAN International Conference on Functional Programming (ICFP), Reviewer.
- 2009 Scheme and Functional Programming Workshop, Program committee.
- 2008 ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages (POPL), Reviewer.
- 2007 IEEE Symposium on Logic in Computer Science (LICS), Reviewer.
EACSL Conference on Computer Science and Logic (CSL), Reviewer.

Recent Talks

- 2011 **Low-level Analysis for High-level Assurance**, GnoSys project report for DARPA CRASH, Boston, Massachusetts, October, 2011.
Verification via Abstract Reduction, NII Workshop on Automated Techniques for Automated Higher-order Program Verification, Shonan Village, Japan, September, 2011.
The Complexity of k CFA, NII Workshop on Automated Techniques for Automated Higher-order Program Verification, Shonan Village, Japan, September, 2011.
What Program Analysis Can and Cannot Do for You, Rice University CS Colloquium, Houston, Texas, March, 2011.
What Program Analysis Can and Cannot Do for You, University of Utah CS Colloquium, Salt Lake City, Utah, February, 2011.
The Paradox of Flow Analysis, Or: What We Talk About When We Talk About Higher-Order Flow Analysis, MIT Programming Languages Working Group, MIT, Cambridge, Massachusetts, February, 2011.
- 2010 **Modular Analysis via Abstract Reduction Semantics**, New Jersey Programming Languages and Systems Symposium, Rutgers University, Piscataway, New Jersey, December.
Pushdown Control-Flow Analysis of Higher-Order Programs, IBM Programming Languages Day, Hawthorne, New York, July.

Recent Talks (continued)

- Abstracting Abstract Machines: Storing and Stacking Continuations**, Harvard Programming Languages Seminar, Harvard University, Cambridge, Massachusetts, July, 2010.
Abstracting Abstract Machines, New England Programming Languages and Systems Symposium, Yale University, New Haven, Connecticut, April, 2010.
Resolving and Exploiting the k -CFA Paradox, University of Oregon CIS Colloquium, Eugene, Oregon, April, 2010.
- 2009 **Resolving and Exploiting the k -CFA Paradox**, New England Programming Languages and Systems Symposium, MIT, Cambridge, Massachusetts, December, 2009.
Subcubic Control-Flow Analysis Algorithms, ACM Symposium in Honor of Mitchell Wand, Northeastern University, Boston, Massachusetts, August, 2009.
The Complexity of Flow Analysis in Higher-Order Languages, Ph.D. defense, Brandeis University, Waltham, Massachusetts, July, 2009.
- 2008 **The Complexity of Flow Analysis**, New England Programming Languages and Systems Symposium, Harvard University, Boston, Massachusetts, November.
The Complexity of Flow Analysis, Northeastern University, Graduate Programming Languages Seminar, Boston, Massachusetts, October.
- 2007 **Relating Complexity and Precision in Control Flow Analysis**, Northeastern University, Programming Languages Seminar, Boston, Massachusetts, May.
Relating Complexity and Precision in Control Flow Analysis, IBM Programming Languages Day, Hawthorne, New York, May.
- 2006 **Linearity and Program Analysis**, Northeastern University, Graduate Programming Languages Seminar, Boston, Massachusetts, October.
Proofnets and Paths in Constructive Classical Logic: Too Old, Too New, Geometry of Interaction Workshop, Geocal'06, Marseille, February.
Algorithmic Trace Effect Analysis, MS thesis defense, University of Vermont, March.
- 2005 **Abstract Machines for the Multi-return λ -calculus**, Northeastern University, "Principles of Programming Languages" graduate seminar, December.
Algorithmic Trace Effect Analysis, University of Vermont Computer Science Research Day, August.
Context Based Security in Programming Languages, Vermont EPSCoR annual conference, August.

Honors & Awards

- 2011 **Communications of the ACM, Research Highlight.**
2009—2011 **Computing Innovation Fellow**, CRA/CCC with funding from the NSF.
2009 **ACM Doctoral Dissertation Award Nominee.**
2004—2005 **Upsilon Pi Epsilon International Computer Science Honor Society.**
2003—2004 **ACM Faculty Award**, College of Engineering & Mathematics, University of Vermont.

Other Activities

- 2009— **Higher-Order Flow Analysis Forum**, Founder, Moderator.
<http://hofa.lambda-calcul.us/>
The HOFA forum is an email forum for the discussion and dissemination of research results in the area of higher-order flow analysis, broadly construed, within computer science and related disciplines. The HOFA forum aims to facilitate theoretical, practical, and application advances in the area of functional, object-oriented, concurrent, distributed, and mobile programming.
- 2004— **Scheme Requests for Implementation**, Editor, Author.
<http://srfi.schemers.org/>
The Scheme Request for Implementation (SRFI) process is a standardization mechanism for the Scheme programming language. Editors are experts from the Scheme community responsible for facilitating the process of public review and ensuring a high standard of quality. I have acted as editor on 14 SRFI standards.
- 2002—2008 **Riverbot**, Implementor, Maintainer.
Riverbot is an online real-time river gauge retrieval service that provides white water boaters with gauge information from the US Army Corps of Engineers and the US Geological Survey. The service is developed in PLT Scheme, a modern safe, functional programming language, and utilizes first class continuations to model user interactions.
- 2002—2005 **Computer Science Student Association (CSSA)**, Program director.
The CSSA is a student advocacy group that promotes community service, provides professional and academic development outside the classroom, represents the student body's interest in departmental affairs. Organized the speaker series for the 2003-2004 and 2004-2005 school years, which brought several leading researchers to UVM. Introduced a university wide programming contest for 2003-2004. Expanded to a state-wide contest for 2004-2005.

References

Olivier Danvy, Matthias Felleisen, Harry Mairson, Olin Shivers, Mitchell Wand