Sam Tobin-Hochstadt

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Research Interests

My research focuses on the design and analysis of software and programming languages. I am particularly interested in how programs grow from prototype scripts to robust software, and how programming language design can support this process.

Appointments

2013– Assistant Professor, School of Informatics, Computing, and Engineering, Indiana University

2011–2013 Research Assistant Professor, CCIS, Northeastern University
2009–2011 Mozilla Postdoctoral Research Fellow, CCIS, Northeastern University
2004–2006 Intern, Programming Languages Research Group, Sun Microsystems Labs

Education

2010 PH.D in Computer Science, Northeastern University
Thesis title: *Typed Scheme: From Scripts to Programs*
Received CCIS Outstanding Research Award
2006 MA in Computer Science, Northeastern University
2003 BS in Computer Science with Honors, University of Chicago

Grants

2015–2018 Gradual Typing Across the Spectrum, Co-Principal Investigator (PI Matthias Felleisen). Grant awarded by NSF Division of Computer and Communication Foundations. $584,715 to IU
2014–2017 Compiler Coaching, Co-Principal Investigator (PI Matthias Felleisen). Grant awarded by NSF Division of Computer and Communication Foundations. $136,247 to IU
2014–2017 Science of Security Lablet, Co-PI for Lablet grant to University of Maryland (PI Jonathan Katz). Grant awarded by National Security Agency. $150,000 to IU
2012–2016 Behavioral Software Contract Verification, Principal Investigator (Co-PI David Van Horn). Grant awarded by NSF Division of Computer and Communication Foundations. $399,992
2011–2012 Gift from the Mozilla Foundation, $74,900
2009–2011 2-year Mozilla Research Fellowship, Mozilla Foundation, $200,000

Awards

2017 Indiana University Trustees Teaching Award
given to a small number of faculty per school each year
2017 Distinguished Visiting Fellow, Scottish Informatics & Computer Science Aliiance
supported a visit to Scotland, hosted by Dr. Patrick Maier

Publications: Journals & Selective Conferences

2018 A Programmable Programming Language, Matthias Felleisen, Matthew Flatt, Robert Bruce Findler, Shriram Krishnamurthi, Eli Barzilay, Jay A. McCarthy, Sam Tobin-Hochstadt, *Communications of the ACM*. **Cover article**

An extended account of contract monitoring strategies as patterns of communication, Cameron Swords, Amr Sabry, Sam Tobin-Hochstadt, *Journal of Functional Programming*.

Soft contract verification for higher-order stateful programs, Phuc Nguyen, Thomas Gilray, Sam Tobin-Hochstadt, David Van Horn, *Proc. 45th Symposium on Principles of Programming Languages (POPL)*. **Artifact successfully evaluated**

2017 Sound gradual typing: only mostly dead, Spenser Bauman, Carl Friedrich Bolz-Tereick, Jeremy G. Siek, Sam Tobin-Hochstadt, *Proc. of the 2017 Conference on Object Oriented Programming Systems, Languages, and Applications (OOPSLA)*.

Compiling Tree Transforms to Operate on Packed Representations, Michael Vollmer, Sarah Spall, Buddhika Chamith, Laith Sakka, Chaitanya Koparkar, Milind Kulkarni, Sam Tobin-Hochstadt, Ryan Newton, *Proc. of the 31st European Conference on Object-Oriented Programming (ECOOP)*.

Migratory Typing, Ten Years Later, Sam Tobin-Hochstadt, Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, Ben Greenman, Andrew M. Kent, Vincent St-Amour, T. Stephen Strickland, Asumu Takikawa, *Proc. of the 2nd Symposium on Advances in Programming Languages (SNAPL)*.

Higher-order symbolic execution for contract verification and refutation, Phuc Nguyen, Sam Tobin-Hochstadt, David Van Horn, *Journal of Functional Programming*.

2016 Occurrence typing modulo theories, Andrew Kent, David Kempe, Sam Tobin-Hochstadt, *Proc. 37th Conference on Programming Language Design and Implementation (PLDI)*. **Artifact successfully evaluated**

A Recursive Union of some Gradual Types, Jeremy Siek, Sam Tobin-Hochstadt, *A list of successes that can change the world: Festschrift in honor of Philip Wadler*.

Parallel Type-checking with Haskell using Saturating LVars and Stream Generators, Ryan Newton, Ömer Sinan Agacan, Peter Fogg, Sam Tobin-Hochstadt, *21st ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming (PPoPP)*.

Practical Optional Typing for Clojure, Ambrose Bonnaire-Sargeant, Rowan Davies, Sam Tobin-Hochstadt, *Proc. of the 25th European Symposium on Programming (ESOP)*.

2015 Pycket: A Tracing JIT For a Functional Language, Spenser Bauman, Carl Friedrich Bolz, Jeremy Siek, Vasily Krilichev, Tobias Pape, Robert Hirshfeld, Sam Tobin-Hochstadt, *Proc. of the 20th International Conference on Functional Programming (ICFP)*.

Expressing Contract Monitors as Patterns of Communication, Cameron Swords, Sam Tobin-Hochstadt, Amr Sabry, *Proc. of the 20th International Conference on Functional Programming (ICFP)*.

Towards Practical Gradual Typing, Asumu Takikawa, Dan Felty, Earl Dean, Matthew Flatt, Robert Bruce Findler, Sam Tobin-Hochstadt, Matthias Felleisen, *Proc. of the 29th European Conference on Object-Oriented Programming (ECOOP)*. **Distinguished Paper Award**

The Racket Manifesto, Matthias Felleisen, Matthew Flatt, Robert Bruce Findler, Shriram Krishnamurthi, Eli Barzilay, Jay A. McCarthy, Sam Tobin-Hochstadt, *Proc. of the 1st Symposium on Advances in Programming Languages (SNAPL)*.

Monotonic References for efficient gradual typing, Jeremy Siek, Michael M. Vitousek, Matteo Cimini, Sam Tobin-Hochstadt, Ronald Garcia, *Proc. of the 24th European Symposium on Programming (ESOP)*.

2014 Soft Contract Verification, Phuc C. Nguyen, Sam Tobin-Hochstadt, David Van Horn, *Proc. 19th International Conference on Functional Programming (ICFP).*

Taming the Parallel Effect Zoo: Extensible Deterministic Parallelism with LVish, Lindsey Kuper, Aaron Todd, Sam Tobin-Hochstadt, Ryan Newton, *Proc. 35th Conference on Programming Language Design and Implementation (PLDI).* **Artifact successfully evaluated**

The Network as a Language Construct, Tony Garnock-Jones, Sam Tobin-Hochstadt, Matthias Felleisen, *Proceedings 22nd European Symposium on Programming (ESOP).*

2013 From Principles to Practice with Class in the First Year, Sam Tobin-Hochstadt, David Van Horn, *Proceedings Second Workshop on Trends in Functional Programming In Education (TFPIE), EPTCS Vol. 136.*

Constraining Delimited Control with Contracts, Asumu Takikawa, T. Stephen Strickland, Sam Tobin-Hochstadt, *Proc. of the 22nd European Symposium on Programming (ESOP).*

2012 Gradual Typing for First-Class Classes, Asumu Takikawa, T. Stephen Strickland, Christos Dimoulas, Sam Tobin-Hochstadt, Matthias Felleisen, *Proc. of the 2012 Conference on Object Oriented Programming Systems, Languages, and Applications (OOPSLA).* **Best Student Paper**

Higher-Order Symbolic Execution via Contracts, Sam Tobin-Hochstadt, David Van Horn, *Proc. of the 2012 Conference on Object Oriented Programming Systems, Languages, and Applications (OOPSLA).*

Optimization Coaching, Vincent St-Amour, Sam Tobin-HochstadtMatthias Felleisen, *Proc. of the 2012 Conference on Object Oriented Programming Systems, Languages, and Applications (OOPSLA).*

Chaperones and Impersonators: Runtime Support for Reasonable Interposition, T. Stephen Strickland, Sam Tobin-Hochstadt, Robert Bruce Findler, Matthew Flatt, *Proc. of the 2012 Conference on Object Oriented Programming Systems, Languages, and Applications (OOPSLA).*

Complete Monitoring for Behavioral Contracts, Christos Dimoulas, Sam Tobin-Hochstadt, Matthias Felleisen, *Proc. 21st European Symposium on Programming (ESOP).*

Run Your Research: On the Effectiveness of Lightweight Mechanization, Casey Klein, John Clements, Christos Dimoulas, Carl Eastlund, Matthias Felleisen, Matthew Flatt, Jay A. McCarthy, Jon Rafkind, Sam Tobin-Hochstadt, Robert Bruce Findler, *Proc. 39th Symposium on Principles of Programming Languages (POPL).*

Typing the Numeric Tower, Vincent St-Amour, Sam Tobin-Hochstadt, Matthew Flatt, and Matthias Felleisen, *2012 Symposium on Practical Aspects of Declarative Languages (PADL).*

The Design and Implementation of Typed Scheme, Sam Tobin-Hochstadt, Matthias Felleisen, *Higher Order and Symbolic Computation (HOSC)*, accepted but did not appear.

2011 Languages as Libraries, Sam Tobin-Hochstadt, Vincent St-Amour, Ryan Culpepper, Matthew Flatt, and Matthias Felleisen, *Proc. 32nd Conference on Programming Language Design and Implementation (PLDI).*

2010 Logical Types for Untyped Languages, Sam Tobin-Hochstadt, Matthias Felleisen, *Proc. 15th International Conference on Functional Programming (ICFP).*

2009 Practical Variable-Arity Polymorphism, T. Stephen Strickland, Sam Tobin-Hochstadt, Matthias Felleisen, *Proc. Eighteenth European Symposium on Programming (ESOP).*

2008 The Design and Implementation of Typed Scheme, Sam Tobin-Hochstadt, Matthias Felleisen, *Proc. 35th Symposium on Principles of Programming Languages (POPL).*

2006 Interlanguage Migration: From Scripts to Programs, Sam Tobin-Hochstadt, Matthias Felleisen, *Dynamic Languages Symposium at OOPSLA (DLS).*

Publications: Workshops & Technical Reports

2014 Meta-tracing makes a fast Racket, Carl Friedrich Bolz, Tobias Pape, Jeremy Siek, Sam Tobin-Hochstadt, *8th Workshop on Dynamic Languages and Applications (DYLA)*.

2011 Semantic Solutions to Program Analysis Problems (Abstract), David Van Horn, Sam Tobin-Hochstadt, *2011 Fun Ideas and Thoughts Session at the 32nd Conference on Programming Language Design and Implementation (FIT)*.

2010 Extensible Pattern Matching for Extensible Languages (Abstract), Sam Tobin-Hochstadt, *2010 Symposium on Implementation and Application of Functional Languages (IFL)*.

Where are you going with those types? (Abstract), Vincent St-Amour, Sam Tobin-Hochstadt, Matthew Flatt, Matthias Felleisen, *2010 Symposium on Implementation and Application of Functional Languages (IFL)*.

Purely Functional Data Structures for Typed Racket, Hari Prashanth K R, Sam Tobin-Hochstadt, *2010 Workshop on Scheme and Functional Programming*.

2009 Cycles without pollution: a gradual typing poem, Sam Tobin-Hochstadt, Robert Bruce Findler, *First Workshop on Script to Program Evolution (STOP)*.

2007 Advanced Macrology and the Implementation of Typed Scheme, Ryan Culpepper, Sam Tobin-Hochstadt, Matthew Flatt, *2007 Workshop on Scheme and Functional Programming*.

2005 A Core Calculus of Metaclasses, Sam Tobin-Hochstadt, Eric Allen, *Twelfth Workshop on Foundations of Object-Oriented Languages (FOOL)*.

2004—2008 Fortress Language Specification, Eric Allen, David Chase, Joe Hallet, Victor Luchangco, Jan-Willem Maessen, Sukyoung Ryu, Guy L. Steele Jr., Sam Tobin-Hochstadt, versions 0.618-1.0, Sun Microsystems Technical Report.

Patents

2006 Method and apparatus for expressing and checking relationships between types, Sukyoung Ryu, Eric Allen, Victor Luchangco, Joe Hallet, Sam Tobin-Hochstadt, US Patent 8,225,294.

Selected Talks

2017 From Scheme to Typed Racket.
Scheme Workshop Keynote
Typed Racket & Gradual Typing.
Laboratory for the Foundations of Computer Science Colloquium
Languages as Libraries.
University of St. Andrews Computer Science Colloquium
Pycket: A tracing JIT for a Functional Language.
University of Glasgow Computer Science Colloquium

2016 Occurrence Typing modulo Theories.
Dagstuhl meeting on Verification of Functional Programs
Pycket: A tracing JIT for a functional language.
École Polytechnique Fédérale de Lausanne, Informatics Colloquium
Workshop on Partial Evaluation and Program Manipulation, Invited Talk
University of Maryland, Computer Science Colloquium
Contracts: Semantics, Verification, Optimization.
Indiana University Computer Science Colloquium

2015 Pycket: A tracing JIT for Racket.
IFIP Working Group 2.16 (Language Design)
2014 Typing Scheme to Typing Racket.
Dagstuhl Meeting on Scripting Languages
Typed Racket: a playground for language design.
IFIP Working Group 2.16 (Language Design)
Typed Racket and Contracts.
Shonan Meeting on Behavioral Specification
Typed Racket as a Research Agenda.
EPFL Department of Computer Science
2013 From Principles to Practice with Class in the First Year.
OOPSLA PC Meeting Workshop
Evolving Software from Scripts to Programs.
ETH Zurich Department of Computer Science
Indiana University Department of Computer Science
Iowa State University Software Engineering Seminar
University of Idaho Department of Computer Science
University of Iowa Department of Computer Science
2012 Research meets Application: Life on the EcmaScript Committee.
Northeastern University Ph.D Seminar
Occurrence Typing. Dagstuhl meeting on Foundation of Scripting Languages
Languages as Libraries. Dagstuhl meeting on Foundation of Scripting Languages
2011 Domain-Specific Languages for GnoSys. DARPA CRASH PI Meeting
Evolving Software from Scripts to Programs. Oregon State Department of Computer Science
2010 From Scripts to Programs. Indiana University Department of Computer Science
Logical Types for Scheme. New England Programming Languages and Systems Symposium
Typed Scheme: From Scripts to Programs. Harvard Programming Languages Seminar
2009 Types for Scheme, in Scheme. Boston Lisp Meeting
Typed Scheme: From Scripts to Programs. Sun Microsystems Laboratories
The Design and Implementation of Typed Scheme. Symposium in Honor of Mitchell Wand
2008 To Type or Not to Type. Northeastern University ACM Lecture Series

Teaching

At Indiana

2017 Introduction to Computer Science
2016 Introduction to Computer Science
Foundations of Programming Languages
2015 Introduction to Computer Science
Topics in Programming Languages: Metaprogramming
2014 Introduction to Computer Science
Object-Oriented Software Management
2013 Object-Oriented Software Development

At Northeastern

2013 Fundamentals of Computer Science 2 (Honors)
2012 Fundamentals of Computer Science 2 (Honors)
2011 Fundamentals of Computer Science 2 (Honors)
2005 Fundamentals of Computer Science 2

Advising

Current Students

2016— Sarah Spall, Ph.D student
2016— Rajan Walia, Ph.D student
2015— Caner Derici, Ph.D student
2014— Ambrose Bonnaire-Sergeant, Ph.D student
2014— Andrew Kent, Ph.D student

Former Students & Postdocs

2015—2017 David Christiansen, Postdoc, now Research Engineer at Galois)
2014—2017 Spenser Bauman, Ph.D student (Left with M.S. Degree), now at MathWorks
2015—2016 David Kempe, MS student
2015—2016 Earl Dean, Undergraduate researcher, now at Institute for Telecommunication Sciences)
2010—2016 Vincent St-Amour, Ph.D student, Northeastern University (Co-advisor), now Research Assistant Professor, Northwestern University
2012—2013 Phil Nguyen, MS student, Northeastern University, now Ph.D student, University of Maryland
2009—2011 Hari Prashanth K R, MS Thesis, Northeastern University, now at Practo
2007 Ivan Gazeau, Ph.D student from École normale supérieure (Paris), now Postdoc at INRIA

Dissertation Committees

2018 Cameron Swords, Indiana University (Chair: Amr Sabry)
2017 Roman Matthias Kiel, Universität Freiburg (Chair: Peter Thiemann)
Tony Garnock-Jones, Northeastern University (Chair: Matthias Felleisen)
2016 Eugene Burmako, Ecole Polytechnique Federale Lausanne (Chair: Martin Odersky)
Asumu Takikawa, Northeastern University (Chair: Matthias Felleisen)

Professional Activities

2019 Symposium on Principles of Programming Languages, Program Committee
2018 SPLASH: OOPSLA, Program Committee
Workshop on Domain-Specific Language Design and Implementation, Co-Chair
2017—2018 SPLASH: OOPSLA, Artifact Evaluation Committee Co-Chair
2017—2018 <Programming>, Program Committee
2017 Symposium on Principles of Programming Languages, External Review Committee
International Conference on Functional Programming, Program Committee
SPLASH: Onward! Research Papers, Program Committee
2016 International Conference on Functional Programming, External Review Committee
ICLOOOPS, Program Committee
Symposium on Functional and Logic Programming, Program Committee
Dynamic Languages Symposium, Program Committee
2015— IFIP Working Group 2.16 (Language Design), Member
2015 Conference on Programming Language Design and Implementation, Program Committee
Symposium on Princples of Programming Languages, External Review Committee
Workshop on Generic Programming, Program Committee
2014 Symposium on Implementation and Application of Functional Languages, Chair
Student Research Competition at ICFP, Program Committee
Dynamic Languages Symposium, Program Committee
Scala Workshop, Program Committee

2014	International Lisp Conference, Program Committee
2013—2014	International Conference on Functional Programming, Workshop Co-Chair
2013	Foundations of Software Engineering New Ideas Track, Program Committee
	Symp. on Implementation and Application of Functional Languages, Program Committee
	SPLASH: OOPSLA, Program Committee
	SPLASH: Doctoral Symposium, Program Committee
2012	Dynamic Languages Symposium, Program Committee
	International Conference on Functional Programming, Program Committee
	Workshop on Script to Program Evolution, Chair
2010—	TC39 - ECMAScript (Standards Committee for JavaScript), Member
2011	Workshop on Scheme and Functional Programming, Program Committee
	New England Programming Languages and Systems Symposium, Chair
	Workshop on Script to Program Evolution, Program Committee
	Workshop on Types in Language Design and Implementation, Program Committee
2010	Workshop on Foundations of Object-Oriented Languages, Program Committee
	Symposium on Trends in Functional Programming, Program Committee

Reviewer for JFP, TOPLAS, ESOP, POPL, OOPSLA, ECOOP, VMCAI, ICFP, GPCE, PLDI

Professional Associations

Association for Computing Machinery, SIGPLAN