Sam Tobin-Hochstadt

Luddy School of Informatics, Computing, & Engineering
Indiana University
700 N. Woodlawn Ave.
Bloomington, IN 47405

3022 Luddy Hall

samth@indiana.edu
samth.github.io

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

2019– Associate Professor, School of Informatics, Computing, and Engineering, Indiana University
2013–2019 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*, CCIS Outstanding Research Award
2006 MA in Computer Science, Northeastern University
2003 BS in Computer Science with Honors, University of Chicago

Grants

2018–2022 Racket on Alternative Platforms, Co-Principal Investigator (PI Matthias Felleisen). Grant awarded
2018–2022 by NSF CRI. $225,996 to IU
Performant Sound Gradual Typing, Principal Investigator (Co-PIs Jeremy Siek and Matthias Felleisen). Grant awarded by NSF CCF. $885,006 to IU
2017–2021 Eat your Wheaties: Multi-Grain Compilers for Parallel Builds at Every Scale, Co-Principal Investigator (PI Ryan Newton). Grant awarded by NSF CCF. $499,986 to IU
2015–2018 Gradual Typing Across the Spectrum, Co-Principal Investigator (PI Matthias Felleisen). Grant awarded by NSF CCF. $584,715 to IU
2014–2017 Compiler Coaching, Co-Principal Investigator (PI Matthias Felleisen). Grant awarded by NSF CCF. $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 CCF. $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

2022 Type checking extracted methods, Yuquan Fu, Sam Tobin-Hochstadt, *The Art, Science, and Engineering of Programming* (to appear).

Sham: a DSL for fast DSLs, Rajan Walia, Chung-chieh Shan, Sam Tobin-Hochstadt, *The Art, Science, and Engineering of Programming*.

2021 Corpse reviver: sound and efficient gradual typing via contract verification, Cameron Moy, Phuc C. Nguyen, Sam Tobin-Hochstadt, David Van Horn, *Proceedings of the ACM on Programming Languages (POPL)*. **Artifact successfully evaluated**

2020 Build Scripts with Perfect Dependencies, Sarah Spall, Neil Mitchell, Sam Tobin-Hochstadt, *Proceedings of the ACM on Programming Languages (OOPSLA)*.

2019 Experience Report: Rebuilding Racket on Chez Scheme, Matthew Flatt, Caner Derici, R. Kent Dybvig, Andrew W. Keep, Gustavo E. Massaccesi, Sarah Spall, Sam Tobin-Hochstadt, Jon Zeppieri, *Proceedings of the International Conference on Functional Programming (ICFP)*. **Artifact successfully evaluated**

From high-level inference algorithms to efficient code, Rajan Walia, Praveen Narayanan, Jacques Carette, Sam Tobin-Hochstadt, Chung-chieh Shan, *Proceedings of the International Conference on Functional Programming (ICFP)*.

Size-change termination as a contract: dynamically and statically enforcing termination for higher-order programs, Phuc Nguyen, Thomas Gilray, Sam Tobin-Hochstadt, David Van Horn, *Proc. Conference on Programming Language Design and Implementation (PLDI)*. **Artifact successfully evaluated**

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)*.

2017 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)*.

2016 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 Intl. 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-Hochstadt, Matthias Felleisen, *Proc. of the 2012 Conference on Object Oriented Programming Systems, Languages, and Applications (OOPSLA)*.

2012 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

2018 Evolving with language.
Indiana University Computer Science Colloquium

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

2021 Introduction to Computer Science
2020 Introduction to Computer Science
2019 Introduction to Computer Science
Specification and Verification
2018 Advanced Functional Programming
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

2021— Kartik Sabharwal, MS student
2019— Yuquan (Fred) Fu, Ph.D student
2016— Sarah Spall, Ph.D student
2016— Rajan Walia, Ph.D student
2015— Caner Derici, Ph.D student

Former Students & Postdocs

2014—2019	Andrew Kent, Ph.D student, now Research Engineer at Galois
2014—2019	Ambrose Bonnaire-Sergeant, Ph.D student, now independent software developer
2018—2019	Paulette Koronkevich, Undergraduate researcher, now Ph.D student at UBC
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

2020	Michael Vollmer, Indiana University (Chair: Ryan Newton)
	Buddhika Chamith, Indiana University (Chair: Ryan Newton)
2019	Michael Vitousek, Indiana University (Chair: Jeremy Siek)
	Jason Hemann, Indiana University (Chair: Daniel Friedman)
	Phil Nguyen, University of Maryland (Chair: David Van Horn)
	Tommaso Petrucciani, University of Genoa (Chair: Giuseppe Castagna)
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

2021	European Conference on Object-Oriented Programming, Program Committee
2018—2021	International Conference on Functional Programming, Publicity Chair & Steering Committee Member
2020	Asian Symposium on Programming Languages and Systems, Program Committee
	Workshop on Generic Programming, Program Committee
	European Symposium on Programming, Program Committee
2019	Symposium on Principles of Programming Languages, Program Committee
2018	SPLASH: OOPSLA, Program Committee
	Workshop on Domain-Specific Language Design and Implementation, Co-Chair
	Workshop on Virtual Machines and Language Implementations, Program Committee
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—2015	IFIP Working Group 2.16 (Language Design), Member

	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
2014	Scala Workshop, Program Committee
	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