

Timothy Richards

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RESEARCH INTEREST

Complex systems involving cloud-based computing platforms, languages, tools, and technologies with a particular emphasis on compilation, transformation, connection, and gathering of large data and the extraction of information that can be applied to learning systems. In particular, the use of web, database, learning, and information gathering technologies for harnessing collective intelligence and collaboration in large-scale learning applications in small-scale learning environments to promote acquisition of knowledge and skill through the experience, study, success, and failures in the context of large learning groups.

EDUCATION

- Ph.D. in Computer Science, UNIVERSITY OF MASSACHUSETTS AMHERST, February 2010
Thesis: Generalized Instruction Selector Generation: The Automatic Construction of Instruction Selectors from Descriptions of Compiler Internal Forms and Target Machines
Advisors: J. Eliot B. Moss and Charles C. Weems
- M.S., Computer Science, UNIVERSITY OF MASSACHUSETTS AMHERST, Spring 2006
Master's Thesis: Proving the Equivalence of Instruction Semantics
Advisors: J. Eliot B. Moss and Charles C. Weems
- B.A. in Computer Science, Magna Cum Laude, CLARK UNIVERSITY, 1999

ACADEMIC POSITIONS & PROFESSIONAL EXPERIENCE

- Lecturer, UNIVERSITY OF MASSACHUSETTS AMHERST, Amherst, MA, 2011 – present
Visiting Assistant Professor, TRINITY COLLEGE, Hartford, CT, 2009 – 2011
Adjunct Faculty Member, CLARK UNIVERSITY, Worcester, MA, 2007 – 2008
Adjunct Faculty Member, SPRINGFIELD COLLEGE, Springfield, MA, 2007 – 2008
Graduate Research Assistant, UNIVERSITY OF MASSACHUSETTS AMHERST, 2002 – 2009
Software Engineer II, CONCORD COMMUNICATIONS, Marlboro, MA, 2000 – 2001
Systems Software Engineer, DIGITAL EQUIPMENT CORPORATION, Shrewsbury, MA, 1999 – 2000

CONFERENCE PUBLICATIONS

1. A Framework for Head-to-Head Comparison of STM Abstractions – Open, Closed, Boosted, and More. Keith Chapman, Tony Hosking, Eliot Moss, Lakshmi Gupta Rajagopal, Ishita Dasgupta, Tim Richards. In the 20th ACM SIGPLAN Symposium on Principles of Parallel Programming. February 2015. *In Submission*.
2. Closed and Open Nested Atomic Actions for Java: Language Design and Prototype Implementation, Keith Chapman, Tony Hosking, Eliot Moss, and Tim Richards. In the 2014 International Conference on Principles and Practice of Programming on the Java Platform: Virtual Machines, Languages, and Tools (PPPJ), pp. 169-180, September 2014.

JOURNAL PUBLICATIONS

1. CASL: A Rapid-prototyping Language for Modern Micro-Architectures, Edward K. Walters II, J. Eliot B. Moss, Trek Palmer, Timothy Richards, and Charles C. Weems. In *Computer Languages, Systems, and Structures*, 2007, Volume 34/4, pp. 195-211.
2. CISL: A Class-based Machine Description Language for Co-Generation of Compilers and Simulators, J. Eliot B. Moss, Trek Palmer, Timothy Richards, Edward K. Walters II, and Charles C. Weems. In *International Journal of Parallel Programming*, Springer-Verlag, Volume 33, Numbers 2-3, pp. 231-246, June 2005.

WORKSHOP PUBLICATIONS

1. Portable Lecture Capture that Captures the Complete Lecture, Ryan Szeto, Rick Adrion, Tung Pham, Tim Richards, Paul Dickson, and Chris Kondrat. In the 10th IEEE International Workshop on Multimedia Technologies for E-Learning (MTEL), Miami, FL, December 2015. *Accepted*.
2. Thinking in Parallel: Hardware to Software - Adopting the TCPP Core Curriculum in Computer Systems Principles, Timothy Richards. In the Third NSF/TCPP Workshop on Parallel and Distributed Computing Education (EduPar-13), Boston, MA, May 2013.
3. Towards Universal Code Generator Generation, Timothy Richards, Edward K. Walters II, J. Eliot B. Moss, Trek Palmer, and Charles C. Weems. In Proceedings of the 2008 International Parallel and Distributed Processing Workshop on Next Generation Software, Miami, FL, April 2008.
4. CMDL: A Class-based Machine Description Language for Co-Generation of Compilers and Simulators, J. Eliot B. Moss, Trek Palmer, Timothy Richards, Edward K. Walters II, and Charles C. Weems. In Proceedings of the 2004 International Parallel and Distributed Processing Symposium Workshop on Next Generation Software, Santa Fe, NM, April 2004.
5. The CoGenT Project: Co-Generating Compilers and Simulators for Dynamically Compiled Languages, J. Eliot B. Moss, Charles C. Weems, and Timothy Richards. In Proceedings of the 2003 International Parallel and Distributed Processing Symposium Workshop on Next Generation Software, Nice, France, April 2003.

TECHNICAL REPORTS

1. A Unified Framework for the Automatic Generation of System Tools and Components, Timothy Richards, Edward K. Walters II, Trek Palmer, J. Eliot B. Moss, and Charles C. Weems. UMass CS Technical Report TR-07-56, 2007.

POSTERS

1. PAOL and Lecture-Viewer, Brendan Murphy, Tung Pham, Raelen Recto, Ryan Szeto, Rick Adrion, Timothy Richards, and Paul Dickson, Conference on the American Society for Engineering Education, Poster Session, 2014.

TEACHING EXPERIENCE

Lecturer, UNIVERSITY OF MASSACHUSETTS AMHERST, Department of Computer Science

- CMPSCI 497: Scalable Web Systems – S15, F15
- CMPSCI 445: Information Systems – F11
- CMPSCI 377: Operating Systems – S16
- CMPSCI 326: Web Programming – S12, Su12, F12, S13, F13, S14, F14, S15, F15
- CMPSCI 230: Computer Systems Principles – F11, S12, F12, S13, F13, S14, F14, S15
- CMPSCI 220: Programming Methodology – F12, F14, S15, F15
- CMPSCI 187: Programming with Data Structures – S12, Su13, S14, Su14, Su15

Visiting Assistant Professor, TRINITY COLLEGE, Department of Computer Science

- CPSC 415: Advanced Web Programming – S10
- CPSC 372: Database Fundamentals – F09, F10
- CPSC 371: Compiler Techniques – S11
- CPSC 333: Computer Networks – S10
- CPSC 225: Server-side Web Programming – F10
- CPSC 225: Client-side Web Programming – S11
- CPSC 110: Computers, Information, & Society – F09, S10, S11

Instructor, CLARK UNIVERSITY, Department of Math & Computer Science

- CSCI 230: Compiler Design – S08

Instructor, SPRINGFIELD COLLEGE, Department of Mathematics, Physics, & Computer Science

CISC 105: Introduction to Computers – F07

Teaching Assistant, UNIVERSITY OF MASSACHUSETTS AMHERST, Department of Computer Science

CMPSCI 610: Compiler Techniques (graduate) – F03, F04, F07, F08

CMPSCI 611x: Advanced Algorithms (graduate) – S06

REU Mentor, UNIVERSITY OF MASSACHUSETTS AMHERST – Su07, Su08, S09, Su10, Su11, Su12

CS Mentor, UNIVERSITY PARK CAMPUS SCHOOL, Worcester, MA, Clark University Partnership

TALKS/WORKSHOPS

1. Web Development: Node and Express in 60 Minutes, Mount Holyoke College, November 2015
2. Development in the Cloud, UMass Amherst, April 2015
3. GIST: Generalized Instruction Selector Generation, Trinity College, April 2010
4. GIST: Generating Instruction Selectors Automatically, DaCapo ITR Grant Meeting, Tufts University, May 2009
5. Towards Universal Code Generator Generation, International Parallel and Distributed Processing Workshop on Next Generation Software, Miami, FL, April 2008
6. Universal Code Generator Generation, DaCapo ITR Grant Meeting, University of Massachusetts Amherst, January 2008
7. Automatic Generation of Functional Simulators from Machine Descriptions, invited talk, Clark University, MA, Spring 2007
8. The CoGenT Project: Co-Generating Compilers and Simulators for Dynamically Compiled Languages, DaCapo ITR Grant Meeting, Albuquerque, NM, August 2003

RESEARCH SUPPORT

1. Micro Virtual Machines for Managed Languages, National Science Foundation CSR Medium, \$170,000, co-PI with Eliot Moss of UMass Amherst and Tony Hosking of Purdue, 2014-2017 (accepted)
2. Geospatial Programming: Child's Play, Google Unrestricted Award, \$18,000, co-PI with Dr. Dana Tomlin of University of Pennsylvania School of Design and Yale School of Forestry and Environmental Studies, 2013 (accepted)
3. Portable Performance for Parallel Managed Languages, National Science Foundation CSR Medium, \$800,000, co-PI with Eliot Moss of UMass Amherst and Tony Hosking of Purdue, 2012-2015 (accepted)
4. Thinking in Parallel: Hardware to Software - Adopting the TCPP Core Curriculum in Computer Systems Principles, National Science Foundation TCPP Early Adopter Status, \$1000, Spring 2012 (accepted)
5. Accelerating JavaScript with Safety and Reliability, Trinity College Student Research Program, \$3500, Summer 2011 (accepted)
6. Describing the Operating System for Accurate User-mode Simulation, National Science Foundation CSR SGER, \$186,770, 2008-2010 (accepted)
7. CoGenT: CoGenerating Tools for Modeling Next Generation Systems, National Science Foundation CSR SMA, \$299,999, 2006-2009 (accepted)
8. Bridging the Compiler-Simulator Gap: Co-Optimizing Hardware and Software for Dynamically Compiled Languages, National Science Foundation, \$300,000, 2003-2006 (accepted)
9. Supporting Compiler/Simulator Co-Evolution for Architectural Exploration and Evaluation, National Science Foundation, \$49,990, 2002 (accepted)

GRADUATE STUDENTS SUPERVISED

Architecture and Language Implementation Laboratory
UNIVERSITY OF MASSACHUSETTS AMHERST, Department of Computer Science

Timm Allman, 2015
Ishita Dasgupta, 2015
Adam Nelson, 2014-2015
Lakshmi Guptha Rajagopal, 2013-2015
Kun Tu, 2012-2013
Addison Mayberry, 2011-2012
Elisabeth Baseman, 2011-2012

Research in Presentation Production for Learning Electronically Laboratory (RIPPLES)
UNIVERSITY OF MASSACHUSETTS AMHERST, Department of Computer Science

Raelen Recto, Co-Chair Masters in CS, 2013-2014

UNDERGRADUATE STUDENTS SUPERVISED

Capstone Research Project
TRINITY COLLEGE, Department of Computer Science

Prasanna Gautam, 2010
Christopher Hawley, 2009
Dana Merrick, 2009

Research Experience for Undergraduates
UNIVERSITY OF MASSACHUSETTS AMHERST, Department of Computer Science

Leah Wolf, Summer 2012
Avery Erwin-McGuire, Summer 2012
Craig Pentrack, Summer 2012
Prasanna Gautam, Summer 2011
Eli Lindsey, Summer 2010
Prasanna Gautam, Summer 2010
Adam Fidel, Summer 2009
Addison Mayberry, Summer 2009
Chujiao Ma, Summer 2009
Kathryn Tipton, Summer 2008
Natasha Kellaway, Summer 2008
Lauren Benson, Summer 2007
Andrea Nickel, Summer 2007
Kate Peterson, Summer 2007

Independent Study, Undergraduate Research, Honors Students
UNIVERSITY OF MASSACHUSETTS AMHERST, Department of Computer Science

Steven Jones, Apple/Android UI Usability, Fall 2015 (Chair Honors)
Gary White, Lecture Viewer/PAOL, Fall 2015 (RIPPLES)
Ryan Stanley, Lecture Viewer/PAOL, Fall 2015 (RIPPLES)
Tri Nguyen, Lecture Viewer/PAOL, Fall 2015 (RIPPLES)
Freddy Nguyen, Lecture Viewer/PAOL, Fall 2014-present (RIPPLES)
Levi Ramsey, Machine Description Languages, Spring 2014 (IS)
Karan Gupta, AI Search Techniques, Spring 2014 (IS)
Tyler Karuzis, Web Systems, Spring 2014 (IS)
Joshua Chudy, Web Systems, Spring 2014 (IS)
Daniel Barrington, Web Systems, Spring 2014 (IS)
Brendan Murphy, Lecture Viewer/PAOL, Fall 2013-2014 (RIPPLES)
Tung Pham, Lecture Viewer/PAOL, Fall 2012-2015 (RIPPLES, Chair Honors)
Ryan Szeto, Lecture Viewer/PAOL, Fall 2012-2015t (RIPPLES, Chair Honors)
Colin Diedrich, Lecture Viewer/PAOL, Fall 2012-2013 (RIPPLES)
Simon Zhang, Lecture Viewer/PAOL, Fall 2012-2013 (RIPPLES)
Stefan Valentin, Lecture Viewer/PAOL, Fall 2012-2013 (RIPPLES)
Kevin Fernades, Fall 2012-present (BDIC)

Derek Anton, Game Design and Implementation, Fall 2012 (IS)
Jordan Moore, Game Design and Implementation, Fall 2012 (IS)
Jacob Eid, Programming the Browser, Spring 2012 (IS)

PROFESSIONAL ACTIVITIES AND SOCIETIES

1. Contributor, Nell Dale and Chip Weems, Programming and Problem Solving With C++, Comprehensive and Brief Sixth Edition, Jones and Bartlett Publishers Inc., 2012-2013.
2. CTW Computer Science Course Module, Online Multi-Player Adventure Game, Summer 2010
3. CTW Computer Science Course Module, Distributed Hash Tables, Summer 2010
4. Technical Book Reviewer, Nell Dale and Chip Weems, Programming and Problem Solving with Java, Second Edition, Jones and Bartlett Publishers Inc., 2008, 838 pp.
5. Reviewer, Architecture Support for Programming Languages and Operating Systems (ASPLOS) 2008,
6. Reviewer, Programming Language Design and Implementation (PLDI) 2007
7. Member of Association for Computing Machinery (ACM)
8. Phi Beta Kappa

COMMITTEES AND SERVICE

1. Undergraduate Program Directory, UMass Amherst, 2016 – present
2. Lecturer Search Committee, UMass Amherst, 2015 – present
3. Teaching Track Committee, UMass Amherst, 2014 – present
4. Scalability Committee, UMass 2014 - 2015
5. Informatics Committee, UMass Amherst, 2013 – 2014
6. Sophomore Advisor, UMass Amherst, 2014 – 2015
7. Chief Undergraduate Advisor (900 CS Students), UMass Amherst, 2012 - 2016
8. Computer Science Honors Program, UMass Amherst, 2011-2012
9. Informatics Committee, UMass Amherst, 2011 - 2012
10. Undergraduate Program Committee, UMass Amherst, 2011 - present

HONORS AND AWARDS

1. Thomas Jefferson Award Recipient, University Park Campus School, Worcester Public Schools

SOFTWARE

AUTO-GRADER & GRADING ASSISTANT	A series of auto-grading systems for large courses. In particular, software for understanding and evaluating student work in the form of artificial grading assistants for evaluating and grading student programming assignments and providing constructive feedback.
LECTURE-VIEWER/PAOL	A system for capturing live lectures and a web presentation system for students to view and interact with recorded lectures in a social-networking environment (http://present.cs.umass.edu).
GIST	A tool for generating instruction selectors automatically from machine descriptions of compiler IR and target instruction sets.
FSGEN	A tool for generating functional simulators from the C _{ISL} machine description language.
CISL COMPILER	A compiler for parsing, analyzing, and generating an intermediate representation for the C _{ISL} machine description language.
CSCI 230 Decaf Compiler	A compiler implemented in Java to compile a C-like language (Decaf) into JVM bytecode. This was used as the class project for CSCI 230 Compiler Design at Clark University.

PISA	A theorem proving system written in Scheme using term rewriting techniques specifically designed for proving the equivalence of machine instruction semantics.
Rolecks	A functional simulator for the ARM architecture written in Java. This simulator was implemented to study instruction semantics, automatic generation of functional simulator components, and the use of Java as an implementation language for functional simulator implementation. Rolecks was used in CMPSCI 201 (Architecture and Assembly Language) and CMPSCI11B (Inside the Box: How Computers Really Work) in the CS department at UMass Amherst during the Spring 2005 and Spring 2010 semesters respectively.
Swatch	A two-pass assembler for the ARM instruction set written in Java. This was used to study the automatic generation of assembler/disassembler components.
CMPSCI 410/610 Pascal Compiler	A Pascal compiler implemented in Java targeting the MIPS processor for a combined graduate/undergraduate course on Compiler Techniques in the CS department at UMass Amherst.