

Ryan R. Newton

Curriculum Vitae

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Interests

Mobile devices, embedded sensors, and pervasive parallelism are changing our computing landscape. I am particularly passionate about a vision of “liquid computation” that moves effortlessly through wireless and wired networks between sensors, actuators, phones, multicore servers, and accelerators (GPUs, FPGAs), handling this immense heterogeneity and taking advantage of it. Making these systems a reality can require delving into several areas of computer science and engineering. Thus my background and interests are interdisciplinary, spanning **sensor networks, parallelizing compilers, embedded operating systems, and domain specific languages.**

Education

- Jan 2009 **Ph.D., EECS**, *Massachusetts Institute of Technology*, Cambridge.
Minor in computational biology. Advisors: Sam Madden & Arvind.
Thesis: “Language Design for Distributed Stream Processing”
- 2005 **S.M., EECS**, *Massachusetts Institute of Technology*, Cambridge.
- 2002 **B.S., Computer Science**, *Indiana University*, Bloomington.
3.89/4.0 GPA, 3.97 in major.
- 1991–1999 **CS, Math**, *MEGSSS/IMACS Program*, Plantation, FL.
7 year math and computer science program, beginning in the 6th grade.

Work Experience

- 2002-2009 **Ph.D. Candidate**, *MIT*, Cambridge, MA.
As a graduate student I worked on issues pertaining to programming sensor networks, optimizing streaming programs, and partitioning computation in a distributed setting. I also, with my collaborators, built and deployed sensor networks. Through my research I contributed software systems to the community that are used by myself and others in various embedded sensing applications, including: acoustic localization of wild animals, computer vision, and detection of potholes with sensor-equipped taxicabs.
- Jun-Sep 2008 **Intern**, *Nokia Research*, Cambridge, MA.
Worked on prototype phone platform. Parallelized computer vision application across phone and PC using WaveScript.
- Jun-Sep 2005 **Intern**, *Microsoft Research*, Redmond, WA.
Framework for automatic composition of sensor network services based on logic programming.

- 2001 **Assistant Editor**, *Indiana University*, Bloomington, IN.
Employed by Dr. Daniel P. Friedman to assign exercise difficulties for the second edition of the *Essentials of Programming Languages* textbook.
- 2000-2002 **Undergraduate Research Assistant**.
- With Dr. Douglas Hofstadter: Developed a cognitive model of pattern perception in a number-sequence microdomain.
 - With Dr. Kent Dybvig: Developed a Scheme compiler for the Microsoft .NET platform.
 - With Dr. Amr Sabry: Translation of the work in Fillinsky's 1994 "Representing Monads" into the purely functional context (Haskell).
- Summer 1999, **Staff programmer**, *Schemer's Inc*, Plantation, FL.
2000 Development work on EdScheme integrated development environment.

Teaching Experience

- Spring 2009 **Recitation Instructor**: MIT's Computer Systems Engineering (6.033).
- 2004-2008 **Resident Tutor, Harvard**: Individual tutoring to students in computer science. General advising to sophomores and students within my residential entryway.
- Fall 2003 **Teaching assistant, MIT**: Multithreaded Parallelism: Languages and Compilers (6.827): assisted in problem set design, grading, and advised student projects.
- 2000,2001 **Teaching Assistant, Indiana U.**: TA for intro programming course: grading and running lab section. TA for undergrad & grad programming language courses: grading, ran recitation section, plus guest lectures in cases of professorial absence.
- 1998-1999, 2000 **Instructor, IMACS**: I was the dedicated instructor for classes at various age levels. Material included basic programming, functional and object-oriented programming, implementation of programming languages, algorithmic 3D modeling, logic, and elementary set theory.

Publications & Presentations

Wishbone: Profile-based Partitioning for Sensornet Applications, Ryan Newton, Sivan Toledo, Lewis Girod, Hari Balakrishnan, Samuel Madden, To appear in ACM SIGCOMM *Networked Systems Design and Implementation (NSDI '09)*, Boston, Massachusetts, April 2009.

Functional in the field, *Presented at ICFP DEFUN*, Victoria, B.C., September 2008.

Design and Evaluation of a Compiler for Embedded Stream Programs, Ryan Newton, Lewis Girod, Michael Craig, Greg Morrisett, Samuel Madden, In ACM SIGPLAN *Languages, Compilers, and Tools for Embedded Systems (LCTES '08)*, Tucson, Arizona, June 2008.

The Pothole Patrol: Using a Mobile Sensor Network for Road Surface Monitoring, Jakob Eriksson, Lewis Girod, Bret Hull, Ryan Newton, Samuel Madden, Hari Balakrishnan, In ACM SIGMOBILE *Mobisys 2008*, Breckenridge, Colorado, June 2008.

VoxNet: An Interactive, Rapidly-Deployable Acoustic Monitoring Platform, Mike Allen, Lewis Girod, Ryan Newton, Daniel T. Blumstein, Deborah Estrin, In ACM/IEEE *International Conference on Information Processing in Sensor Networks*, SPOTS track (IPSN/SPOTS '08), St. Louis, Missouri, April 2008.

XStream: A Signal-Oriented Data Stream Management System, Lewis Girod, Yuan Mei, Ryan Newton, Stanislav Rost, Arvind Thiagarajan, Hari Balakrishnan, Samuel Madden, In *IEEE International Conference on Data Engineering (ICDE'08)*, Cancun, Mexico, April 2008.

The Regiment Macroprogramming System, Ryan Newton, Greg Morrisett, Matt Welsh, In *ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN'07)*, Cambridge, MA, April 2007.

The Case for a Signal-Oriented Data Stream Management System, Lewis Girod, Yuan Mei, Ryan Newton, Stanislav Rost, Arvind Thiagarajan, Hari Balakrishnan, Samuel Madden, In *ACM SIGMOD Conference on Innovative Data Systems Research (CIDR'07)*, Pacific Grove, CA, January 2007.

WaveScript: Language Support for Distributed Stream Processing, Presented at *Northeastern University PL Seminar*, November 2007.

Functional Programming in the Wild, Presented at *NEPLS*, October 2007.

Compiling Functional Reactive Macroprograms, Ryan Newton, *Masters Thesis*, 2005.

Building up to Macroprogramming: An Intermediate Language for Sensor Networks, Ryan Newton, Arvind, Matt Welsh, In *ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN'05)*, Los Angeles, CA, April 2005.

Region Streams: Functional Macroprogramming for Sensor Networks, Ryan Newton, Matt Welsh, In *International Workshop on Data Management for Sensor Networks (DMSN'04)*, Toronto, Canada, August 2004. (>100 citations).

Amorphous Language Implementation, Ryan Newton, Jake Beal, *CSAIL Technical Report MIT-CSAIL-TR-2006-015*, 2002.

Software Released

- **Regiment:** Compiler and network simulator for programming sensor networks in terms of high-level abstractions.
- **WaveScript:** Compiler and runtime/scheduler for distributed stream processing, targets many embedded platforms.

Service Activities

2004 **Organizer:** Student reading group on radical programming models and proposals.

External Reviewer:

- 2006 *European Conference on Wireless Sensor Networks (EWSN)*
- 2006, 2007 *Information Processing in Sensor Networks (IPSN)*
- 2007 *Programming Language Design and Implementation (PLDI)*
- 2006, 2008 *Conference on Embedded Networked Sensor Systems (Sensys)*
- 2008 *ACM Transactions on Sensor Networks (TOSN)*

Awards

Indiana University Faculty Scholarship, Exxon Scholarship. NSF and NDSEG graduate fellowships.

Proficiencies

Programming Languages	C/C++, Scheme, OCaml/SML, Haskell, some Java	Operating Systems	Linux, Windows, Mac OS, various embedded (e.g. TinyOS)
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Miscellaneous

Citizenship: United States

References

- 1 **Samuel R. Madden**
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ITT Career Development Professor
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- 4 **J. Gregory Morrisett**
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