

Stephen A. Edwards
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Research Interests

Languages and compilers for Embedded Systems. Computer-Aided Digital Design.

Experience

Columbia University, New York Associate professor, Department of Computer Science; Tenure awarded June, 2008	2006–present
Columbia University, New York Assistant professor, Department of Computer Science	2001–2006
Google X, Mountain View, California Visiting Professor. Host: Satnam Singh.	June, July 2018
École Normale Supérieure, Paris, France Invited Professor, Computer Science Department. Host: Marc Pouzet	June, July 2012
Microsoft Research, Cambridge, UK Visiting Researcher. Host: Satnam Singh.	July, August 2010
Synopsys, Mountain View, California Senior R&D Engineer	1998–2001
Simplex Solutions, Sunnyvale, California Senior Member of Technical Staff.	1997–1998
Interval Research Corporation, Palo Alto, California Researcher.	Summer 1993
Vitesse Semiconductor, Camarillo, California VLSI Design Engineer.	Summer 1991
Microsoft, Redmond, Washington Hardware Design Engineer.	Summer 1990

Education

University of California, Berkeley Ph.D in Electrical Engineering Edward A. Lee, advisor Thesis: <i>The Specification and Execution of Heterogeneous Synchronous Reactive Systems.</i>	1994–1997
University of California, Berkeley M.S. in Electrical Engineering. A. Richard Newton, advisor Thesis: <i>An Esterel Compiler for a Synchronous/Reactive Development System.</i>	1992–1994
California Institute of Technology B.S. with Honors, Electrical Engineering	1988–1992

Honors and Awards

Best paper award Design Automation and Test in Europe Munich, Germany (given to 2 of 800+ submissions)	March 2006
Senior Member IEEE (Institute of Electrical and Electronics Engineers) This is the main professional organization for Electrical Engineers	2006
National Science Foundation Faculty Early Career Development (“CAREER”) Award “Designing Embedded Systems with Domain-Specific Languages” I won this award the first time I applied.	2002
NSF Graduate Research Fellowship Three years tuition & stipend, awarded annually to about 800 of 5000 applicants.	1994–1996
California Fellowship in Microelectronics One year tuition plus stipend.	1992–1993
Caltech Merit Award One year full tuition, awarded annually to about 45 of 800 undergraduates.	1990–1991, 1991–1992

Research Support

NSF CCF-SHF 1162124: \$1.2M total (my share \$600k) <i>SHF:Medium:Compiling Parallel Algorithms to Memory Systems</i> with Martha A. Kim.	2012–2016
NSF CCF-SHF 1065338: \$625k total (my share \$208k) <i>SHF:Medium:Type-Specific Instruction Processing</i> with Martha A. Kim and Ken Ross.	2011–2014
NSF CSR-EHS 0720292: \$1.2M total (my share \$200k) <i>CSR-EHS:PRET: Precision Timed Architectures</i> with Edward A. Lee et al.	2007–2010
NSF CSR-EHS 0614799: \$240k <i>CSR-EHS:SHIM: Developing Embedded Systems with Deterministic Concurrency</i>	2006–2008
Gift from Altera, \$20k <i>Hardware Software Co-Synthesis from SHIM,</i>	2006
Joint Semiconductor Research Corporation/Microelectronic Design Center, \$300k <i>High-Level Synthesis from the Synchronous Language Esterel</i>	2003–2006
New York State, NYSTAR program, matching funds, \$11k	2002
Hardware grant from Intel, \$13k	2002
Gift from Intel: \$25k <i>High-level Synthesis from the Synchronous Language Esterel</i>	2002
NSF Faculty Early Career Development (CAREER) Award 0133348: \$300k <i>CAREER:Designing Embedded Systems with Domain-Specific Languages</i>	2002–2007

Released Software

The Columbia Esterel Compiler (2003–)

- Only open-source compiler for the Esterel language.
- Generates the most efficient C code for Esterel of any known compiler, including the commercial implementation.
- Used at Freescale semiconductor, NASA, University of Kiel, and University of Auckland. Cited in about 15 papers.
- The CEC-Users mailing list has 32 subscribers from companies including Motorola, TI, Esterel Technologies, Philips, Intel, IBM, and Xilinx
- <http://www1.cs.columbia.edu/~sedwards/cec/>

The EstBench Esterel benchmark suite (2004)

- Only public benchmark suite for the Esterel language
- Cited in about ten papers
- <http://www1.cs.columbia.edu/~sedwards/software.html>

The Ext C-code documentation extraction system (1997)

- Used in the widely-distributed VIS and CUDD software packages (at University of Colorado, Boulder). Cited in a few papers.
- <http://www1.cs.columbia.edu/~sedwards/ext/>

Publications

Patent

US Patent 7,100,164. “Method & Apparatus for Converting a Concurrent Control Flow Graph into a Sequential Control Flow Graph.” Filed January 6th, 2000, issued August 29th, 2006.

Books

- [1] Dumitru Potop-Butucaru, Stephen A. Edwards, and Gérard Berry. *Compiling Esterel*. Springer, January 2007.
- [2] Stephen A. Edwards. *Languages for Digital Embedded Systems*. Kluwer, Boston, Massachusetts, September 2000.

Chapters in Books

- [3] Stephen A. Edwards. [On determinism](#). In Patricia Derler, Marten Lohstroh, and Marjan Sirjani, editors, *Principles of Modeling: Essays dedicated to Edward A. Lee on the Occasion of his 60th Birthday*, volume 10760 of *Lecture Notes in Computer Science*, pages 240–253. Springer, Berkeley, California, October 2017.
- [4] Stephen A. Edwards and Joseph T. Buck. System-level specification and modeling languages. In Luciano Lavagno, Igor L. Markov, Grant Martin, and Louis K. Scheffer, editors, *Electronic Design Automation for IC System Design, Verification, and Testing*, chapter 4, pages 59–74. CRC Press, December 2016.
- [5] Stephen A. Edwards and Joseph T. Buck. Design and verification languages. In Luciano Lavagno, Igor L. Markov, Grant Martin, and Louis K. Scheffer, editors, *Electronic Design Automation for IC System Design, Verification, and Testing*, chapter 15, pages 373–400. CRC Press, December 2016.
- [6] Stephen A. Edwards and Nalini Vasudevan. [Compiling SHIM](#). In Sandeep K. Shukla and Jean-Pierre Talpin, editors, *Synthesis of Embedded Software: Frameworks and Methodologies for Correctness by Construction*, chapter 4, pages 121–146. Springer, January 2010.
- [7] Stephen A. Edwards. Design and verification languages. In Luciano Lavagno, Grant Martin, and Lou Scheffer, editors, *Electronic Design Automation for Integrated Circuits Handbook*. CRC Press, Boca Raton, Florida, January 2006.
- [8] Stephen A. Edwards. Languages for embedded systems. In Richard Zurawski, editor, *The Embedded Systems Handbook*, pages 7–1–7–19. CRC Press, Boca Raton, Florida, January 2005.
- [9] Stephen A. Edwards. Languages for embedded systems. In Richard Zurawski, editor, *The Industrial Information Technology Handbook*, pages 85–1–85–18. CRC Press, Boca Raton, Florida, December 2004.

Journal Papers

All journal papers were peer-reviewed. The Proceedings of the IEEE papers were invited, as all papers in that journal are.

- [10] Stephen A. Edwards, Richard Townsend, Martha Barker, and Martha A. Kim. Compositional dataflow circuits. *ACM Transactions on Embedded Computing Systems*, 18(1):5, February 2019.

- [11] Lisa Wu, Martha A. Kim, and Stephen A. Edwards. [Cache impacts of datatype acceleration](#). *Computer Architecture Letters*, 11(1):21–24, January 2012. Selected as one of the “Best Papers from Computer Architecture Letters” in 2011.
- [12] Nalini Vasudevan and Stephen A. Edwards. [Buffer sharing in rendezvous programs](#). *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 29(10):1471–1480, October 2010.
- [13] Marcio Buss, Daniel Brand, Vugranam Sreedhar, and Stephen A. Edwards. [A novel analysis space for pointer analysis and its application for bug finding](#). *Science of Computer Programming*, 75(11):921–942, November 2010.
- [14] Cristian Soviani, Ilija Hadžić, and Stephen A. Edwards. [Synthesis and optimization of pipelined packet processors](#). *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 28(2):231–244, February 2009.
- [15] Osama Neiroukh, Stephen A. Edwards, and Xiaoyu Song. [Transforming cyclic circuits into acyclic equivalents](#). *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 27(10):1775–1787, October 2008.
- [16] Stephen A. Edwards and Jia Zeng. [Code generation in the Columbia Esterel Compiler](#). *EURASIP Journal on Embedded Systems*, 2007:Article ID 52651, 31 pages, February 2007.
- [17] Cristian Soviani, Olivier Tardieu, and Stephen A. Edwards. [Optimizing sequential cycles through Shannon decomposition and retiming](#). *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 26(3):456–467, March 2007.
- [18] Stephen A. Edwards. The challenges of synthesizing hardware from C-like languages. *IEEE Design & Test of Computers*, 23(5):375–386, September 2006.
- [19] Stephen A. Edwards and Olivier Tardieu. [SHIM: A deterministic model for heterogeneous embedded systems](#). *IEEE Transactions on Very Large Scale Integration (VLSI) Systems*, 14(8):854–867, August 2006.
- [20] Stephen A. Edwards. [Experiences teaching an FPGA-based embedded systems class](#). *ACM SIGBED Review*, 2(4):56–62, October 2005. Originally presented at the Workshop on Embedded Systems Education.
- [21] Stephen A. Edwards and Edward A. Lee. [The semantics and execution of a synchronous block-diagram language](#). *Science of Computer Programming*, 48(1):21–42, July 2003. 16 citations on Google Scholar.
- [22] Stephen A. Edwards. [Tutorial: Compiling concurrent languages for sequential processors](#). *ACM Transactions on Design Automation of Electronic Systems*, 8(2):141–187, April 2003. 19 citations on Google Scholar.
- [23] Albert Benveniste, Paul Caspi, Stephen A. Edwards, Nicolas Halbwachs, Paul Le Guernic, and Robert de Simone. [The synchronous languages 12 years later](#). *Proceedings of the IEEE*, 91(1):64–83, January 2003. Invited. 174 citations on Google Scholar.
- [24] Stephen A. Edwards. [An Esterel compiler for large control-dominated systems](#). *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems*, 21(2):169–183, February 2002. 37 citations on Google Scholar.
- [25] Stephen Edwards, Luciano Lavagno, Edward A. Lee, and Alberto Sangiovanni-Vincentelli. [Design of embedded systems: Formal models, validation, and synthesis](#). *Proceedings of the IEEE*, 85(3):366–390, March 1997. Invited. 272 citations on Google Scholar.

Conference Papers

All conference papers were peer-reviewed. In my area, conference papers are preferred over journals because conferences are more selective and more widely read.

- [26] Stephen A. Edwards, Richard Townsend, and Martha A. Kim. Compositional dataflow circuits. In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, pages 175–184, Vienna, Austria, September 2017. Association for Computing Machinery. 15/48 = 31%.
- [27] Andrea Lottarini, Stephen A. Edwards, Kenneth A. Ross, and Martha A. Kim. Network synthesis for database processing units. In *Proceedings of the Design Automation Conference (DAC)*, Austin, Texas, June 2017. ACM.
- [28] Richard Townsend, Martha A. Kim, and Stephen A. Edwards. From functional programs to pipelined dataflow circuits. In *Proceedings of Compiler Construction (CC)*, pages 76–86, Austin, Texas, February 2017. ACM. 13/53 = 25%.
- [29] Bingyi Cao, Kenneth A. Ross, Martha A. Kim, and Stephen A. Edwards. Implementing latency-insensitive dataflow blocks. In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, pages 179–187, Austin, Texas, September 2015. The Institute of Electrical and Electronics Engineers (IEEE).
- [30] Kuangya Zhai, Richard Townsend, Lianne Lairmore, Martha A. Kim, and Stephen A. Edwards. Hardware synthesis from a recursive functional language. In *Proceedings of the International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS)*, pages 83–93, Amsterdam, The Netherlands, October 2015. IEEE. 540/1741 = 31%.
- [31] Stephen A. Edwards and Hiren Patel. MEMOCODE 2014 software design contest: Space invaders emulator. In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, page 185, Lausanne, Switzerland, October 2014. The Institute of Electrical and Electronics Engineers (IEEE). Invited.
- [32] Stephen A. Edwards. [MEMOCODE 2012 hardware/software codesign contest: DNA sequence aligner](#). In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, pages 85–90, Arlington, Virginia, July 2012.
- [33] Nalini Vasudevan, Kedar Namjoshi, and Stephen A. Edwards. [Simple and fast biased locks](#). In *Proceedings of the International Conference on Parallel Architectures and Compilation Techniques (PACT)*, pages 65–74, Vienna, Austria, September 2010.
- [34] Stephen A. Edwards, Sungjun Kim, Edward A. Lee, Isaac Liu, Hiren D. Patel, and Martin Schoeberl. [A disruptive computer design idea: Architectures with repeatable timing](#). In *Proceedings of the IEEE International Conference on Computer Design (ICCD)*, Lake Tahoe, CA, October 2009.
- [35] Baolin Shao, Nalini Vasudevan, and Stephen A. Edwards. [Compositional deadlock detection for rendezvous communication](#). In *Proceedings of the International Conference on Embedded Software (Emsoft)*, pages 59–66, Grenoble, France, October 2009. 33/106 = 31%.
- [36] Nalini Vasudevan and Stephen A. Edwards. [Buffer sharing in CSP-like programs](#). In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, Cambridge, Massachusetts, July 2009. 15/42 = 36%.
- [37] Nalini Vasudevan and Stephen A. Edwards. [A determinizing compiler](#). In *Programming Languages Design and Implementation (PLDI) - Fun Ideas and Thoughts Session*, Dublin, Ireland, June 2009.

- [38] Nalini Vasudevan, Olivier Tardieu, Julian Dolby, and Stephen A. Edwards. [Compile-time analysis and specialization of clocks in concurrent programs](#). In *Proceedings of Compiler Construction (CC)*, volume 5501 of *Lecture Notes in Computer Science*, pages 48–62, York, United Kingdom, March 2009.
- [39] Nalini Vasudevan and Stephen A. Edwards. [Celling SHIM: Compiling deterministic concurrency to a heterogeneous multicore](#). In *Proceedings of the Symposium on Applied Computing (SAC)*, volume III, pages 1626–1631, Honolulu, Hawaii, March 2009. 1084/316 = 29%.
- [40] Ben Lickly, Isaac Liu, Sungjun Kim, Hiren D. Patel, Stephen A. Edwards, and Edward A. Lee. [Predictable programming on a precision timed architecture](#). In *Proceedings of the International Conference on Compilers, Architecture, and Synthesis for Embedded Systems (CASES)*, pages 137–146, Atlanta, Georgia, October 2008.
- [41] Nalini Vasudevan and Stephen A. Edwards. [Static deadlock detection for the SHIM concurrent language](#). In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, pages 49–58, Anaheim, California, June 2008.
- [42] Nalini Vasudevan, Satnam Singh, and Stephen A. Edwards. [A deterministic multi-way rendezvous library for Haskell](#). In *Proceedings of the International Parallel and Distributed Processing Symposium (IPDPS)*, pages 1–12, Miami, Florida, April 2008. 105/410 = 25%.
- [43] Stephen A. Edwards, Nalini Vasudevan, and Olivier Tardieu. [Programming shared memory multiprocessors with deterministic message-passing concurrency: Compiling SHIM to Pthreads](#). In *Proceedings of Design, Automation, and Test in Europe (DATE)*, pages 1498–1503, Munich, Germany, March 2008.
- [44] Marcio Buss, Daniel Brand, Vugranam Sreedhar, and Stephen A. Edwards. [Flexible pointer analysis using assign-fetch graphs](#). In *Proceedings of the Symposium on Applied Computing (SAC)*, pages 234–239, Fortaleza, Ceará, Brazil, March 2008. 384/1307 = 29.3%.
- [45] Stephen A. Edwards and Edward A. Lee. [The case for the precision timed \(PRET\) machine](#). In *Proceedings of the 44th Design Automation Conference*, pages 264–265, San Diego, California, June 2007. 8/54 = 15% (“WACI” track).
- [46] Haim Cohen and Stephen A. Edwards. [{sets}](#)—a lightweight constraint programming language based on ROBDDs. In *Proceedings of the IADIS International Conference on Applied Computing*, Salamanca, Spain, February 2007.
- [47] Olivier Tardieu and Stephen A. Edwards. [Scheduling-independent threads and exceptions in SHIM](#). In *Proceedings of the International Conference on Embedded Software (Emsoft)*, pages 142–151, Seoul, Korea, October 2006. 31/94 = 33%.
- [48] Olivier Tardieu and Stephen A. Edwards. [R-SHIM: Deterministic concurrency with recursion and shared variables](#). In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, page 202, Napa, California, July 2006. 17 papers + 6 posters / 43 = 53%.
- [49] Nicholas Jun Hao Ip and Stephen A. Edwards. [A processor extension for cycle-accurate real-time software](#). In *Proceedings of the IFIP International Conference on Embedded and Ubiquitous Computing (EUC)*, volume 4096 of *Lecture Notes in Computer Science*, pages 449–458, Seoul, Korea, August 2006. approx. 125/500 = 25%.

- [50] Stephen A. Edwards and Olivier Tardieu. [Efficient code generation from SHIM models](#). In *Proceedings of Languages, Compilers, and Tools for Embedded Systems (LCTES)*, pages 125–134, Ottawa, Canada, June 2006. 21/83 = 25%.
- [51] Cristian Soviani, Ilija Hadžić, and Stephen A. Edwards. [Synthesis of high-performance packet processing pipelines](#). In *Proceedings of the 43rd Design Automation Conference*, pages 679–682, San Francisco, California, July 2006. 180/865 = 20%.
- [52] Cristian Soviani, Olivier Tardieu, and Stephen A. Edwards. [Optimizing sequential cycles through Shannon decomposition and retiming](#). In *Proceedings of Design, Automation, and Test in Europe (DATE)*, pages 1085–1090, Munich, Germany, March 2006. 233/834 = 28%, **Best paper award**.
- [53] Osama Neiroukh, Stephen A. Edwards, and Xiaoyu Song. [An efficient algorithm for the analysis of cyclic circuits](#). In *Proceedings of the Symposium on VLSI (ISVLSI)*, pages 303–308, Karlsruhe, Germany, March 2006. 64/151 = 42%.
- [54] Jia Zeng and Stephen A. Edwards. [Separate compilation for synchronous modules](#). In *Proceedings of the 2nd International Conference on Embedded Software and Systems (ICCESS)*, volume 3820 of *Lecture Notes in Computer Science*, pages 129–140, Xi’an, China, December 2005. 140/360 = 39% overall, 63/360 = 17% for proceedings.
- [55] Olivier Tardieu and Stephen A. Edwards. [Approximate reachability for dead code elimination in Esterel*](#). In *Proceedings of the Third International Symposium on Automated Technology for Verification and Analysis (ATVA)*, volume 3707 of *Lecture Notes in Computer Science*, pages 323–337, Taipei, Taiwan, October 2005. 33/95 = 35%.
- [56] Stephen A. Edwards and Olivier Tardieu. [SHIM: A deterministic model for heterogeneous embedded systems](#). In *Proceedings of the International Conference on Embedded Software (Emsoft)*, pages 37–44, Jersey City, New Jersey, September 2005. 25/88 = 28%, 10 citations on Google Scholar.
- [57] Stephen A. Edwards and Olivier Tardieu. [Deterministic receptive processes are Kahn processes](#). In *Proceedings of the International Conference on Formal Methods and Models for Codesign (MEMOCODE)*, pages 37–44, Verona, Italy, July 2005. 17/47 = 36%.
- [58] Christopher L. Conway, Kedar S. Namjoshi, Dennis Dams, and Stephen A. Edwards. [Incremental algorithms for inter-procedural analysis of safety properties](#). In *Proceedings of the 17th International Conference on Computer-Aided Verification (CAV)*, volume 3576 of *Lecture Notes in Computer Science*, pages 449–461, Edinburgh, Scotland, June 2005. 32/123 = 26%.
- [59] Stephen A. Edwards. [The challenges of hardware synthesis from C-like languages](#). In *Proceedings of Design, Automation, and Test in Europe (DATE)*, pages 66–67, Munich, Germany, March 2005. 176/825 = 21%. 17 citations on Google Scholar., Invited.
- [60] Jia Zeng, Cristian Soviani, and Stephen A. Edwards. [Generating fast code from concurrent program dependence graphs](#). In *Proceedings of Languages, Compilers, and Tools for Embedded Systems (LCTES)*, pages 175–181, Washington, DC, June 2004. 28/120 = 23%.
- [61] Christopher L. Conway and Stephen A. Edwards. [NDL: A domain-specific language for device drivers](#). In *Proceedings of Languages, Compilers, and Tools for Embedded Systems (LCTES)*, pages 30–36, Washington, DC, June 2004. 28/120 = 23%.
- [62] Stephen A. Edwards. [Making cyclic circuits acyclic](#). In *Proceedings of the 40th Design Automation Conference*, pages 159–162, Anaheim, California, June 2003. 152/628 = 24%. 13 citations on Google Scholar.

- [63] Stephen Jan, Paolo de Dios, and Stephen A. Edwards. [Porting a network cryptographic service to the RMC2000: A case study in embedded software development](#). In *Designers' Forum: Design Automation and Test in Europe Conference and Exhibition*, pages 150–155, Munich, Germany, March 2003. 98 long + 54 short + 36 designer's forum/590 = 32%, Also appears as Chapter 13 of *Embedded Software for SoC*, Jerraya, Yoo, Verkest and Wehn eds., Kluwer, 2003.
- [64] Sandeep Shukla, Stephen A. Edwards, Jean-Pierre Talpin, and Rajesh K. Gupta. [Tutorial: High level modeling and validation methodologies for embedded systems: bridging the productivity gap](#). In *Proceedings of the 16th International Conference on VLSI Design*, pages 9–14, New Delhi, India, January 2003.
- [65] Stephen A. Edwards, Tony Ma, and Robert Damiano. [Using a hardware model checker to verify software](#). In *Proceedings of the 4th International Conference on ASIC (ASICON)*, pages 85–90, Shanghai, China, October 2001.
- [66] Stephen A. Edwards. [Compiling Esterel into sequential code](#). In *Proceedings of the 37th Design Automation Conference*, pages 322–327, Los Angeles, California, June 2000. Association for Computing Machinery. 154/445 = 35%, Cited by 47 in Google Scholar.
- [67] Gitanjali Swamy, Stephen Edwards, and Robert Brayton. Efficient verification and synthesis using design commonalities. In *Proceedings of the Eleventh International Conference on VLSI Design (VLSI'98)*, pages 542–551, Chennai, India, January 1998.
- [68] Robert K. Brayton, Gary D. Hachtel, Alberto L. Sangiovanni-Vincentelli, Fabio Somenzi, Adnan Aziz, Szu-Tsung Cheng, Stephen A. Edwards, Sunil P. Khatri, Yuji Kukimoto, Abelardo Pardo, Shaz Qadeer, Rajeev K. Ranjan, Shaker Sarwary, Thomas R. Shiple, Gitanjali Swamy, and Tiziano Villa. [VIS](#). In *Formal Methods in Computer-Aided Design (FMCAD)*, volume 1166, pages 248–256, Palo Alto, California, November 1996.
- [69] Robert K. Brayton, Gary D. Hachtel, Alberto Sangiovanni-Vincentelli, Fabio Somenzi, Adnan Aziz, Szu-Tsung Cheng, Stephen Edwards, Sunil Khatri, Yuji Kukimoto, Abelardo Pardo, Shaz Qadeer, Rajeev K. Ranjan, Shaker Sarwary, Thomas R. Shiple, Gitanjali Swamy, and Tiziano Villa. [VIS: A system for verification and synthesis](#). In *Proceedings of the 8th International Conference on Computer-Aided Verification (CAV)*, volume 1102 of *Lecture Notes in Computer Science*, pages 428–432, New Brunswick, New Jersey, July 1996. Springer. 32/93 = 34%, 367 citations on Google Scholar.

Workshop Papers

All workshop papers were peer-reviewed. Those at IWLS have limited distribution.

- [70] Stephen A. Edwards. Further experiences teaching an FPGA-based embedded systems class. In *Proceedings of the Workshop on Embedded Systems Education (WESE)*, Turin, Italy, October 2018.
- [71] Bingyi Cao, Kenneth A. Ross, Stephen A. Edwards, and Martha A. Kim. [Deadlock-free joins in DB-Mesh, an asynchronous systolic array accelerator](#). In *Proceedings of the Workshop on Data Management on New Hardware (DaMoN)*, Chicago, Illinois, May 2017. Article No. 5.
- [72] Richard Townsend, Martha A. Kim, and Stephen A. Edwards. [Resource allocation for hardware implementations of map](#). In *Proceedings of the Workshop on Architectures and Systems for Big Data (ASBD)*, Minneapolis, Minnesota, June 2014.
- [73] Stephen A. Edwards, Alain Girault, and Klaus Schneider. [Synchronous Programming \(Dagstuhl Seminar 13471\)](#). *Dagstuhl Reports*, 3(11):117–143, March 2014.

- [74] Martha A. Kim and Stephen A. Edwards. [Computation vs. memory systems: Pinning down accelerator bottlenecks](#). In *Proceedings of the Workshop on Architectural and Microarchitectural Support for Binary Translation (AMAS-BT)*, Saint-Malo, France, June 2010.
- [75] Nalini Vasudevan and Stephen A. Edwards. [Determinism should ensure deadlock-freedom](#). In *Proceedings of the 2nd USENIX Workshop on Hot Topics in Parallelism (HotPar)*, Berkeley, California, June 2010.
- [76] Nalini Vasudevan and Stephen A. Edwards. [Ensuring deterministic concurrency through compilation](#). In *Proceedings of the IEEE International Parallel and Distributed Processing Symposium Workshops*, Atlanta, USA, April 2010.
- [77] Stephen A. Edwards. [Concurrency and communication: Lessons from the SHIM project](#). In *Proceedings of the Workshop on Software Technologies for Future Embedded and Ubiquitous Systems (SEUS)*, volume 5860 of *Lecture Notes in Computer Science*, pages 276–287, Newport Beach, California, November 2009. Springer.
- [78] Stephen A. Edwards, Sungjun Kim, Edward A. Lee, Hiren D. Patel, and Martin Schoeberl. [Reconciling repeatable timing with pipelining and memory hierarchy](#). In *Proceedings of the Workshop on Reconciling Performance with Predictability (RePP)*, Grenoble, France, October 2009.
- [79] Stephen A. Edwards and Jia Zeng. [Static elaboration of recursion for concurrent software](#). In *Proceedings of the Workshop on Partial Evaluation and Program Manipulation (PEPM)*, pages 71–80, San Francisco, California, January 2008. $20/74 = 27\%$.
- [80] Cristian Soviani and Stephen A. Edwards. [FIFO sizing for high-performance pipelines](#). In *Proceedings of the International Workshop on Logic Synthesis (IWLS)*, San Diego, California, June 2007.
- [81] Olivier Tardieu and Stephen A. Edwards. Instantaneous transitions in Esterel. In *Proceedings of the Workshop on Model-Driven High-Level Programming of Embedded Systems (SLA++P)*, Braga, Portugal, March 2007. $9/16 = 56\%$.
- [82] Becky Plummer, Mukul Khajanchi, and Stephen A. Edwards. An Esterel virtual machine for embedded systems. In *Proceedings of Synchronous Languages, Applications, and Programming (SLAP)*, Electronic Notes in Theoretical Computer Science, pages 1–14, Vienna, Austria, March 2006.
- [83] Jia Zeng, Chuck Mitchell, and Stephen A. Edwards. A domain-specific language for generating dataflow analyzers. In *Proceedings of the Sixth Workshop on Language Descriptions, Tools and Applications*, Vienna, Austria, April 2006. $7/21 = 33\%$.
- [84] Stephen A. Edwards. [Using program specialization to speed SystemC fixed-point simulation](#). In *Proceedings of the Workshop on Partial Evaluation and Program Manipulation (PEPM)*, pages 21–28, Charleston, South Carolina, January 2006. $17/29 = 59\%$.
- [85] Cristian Soviani, Stephen A. Edwards, and Angelos Keromytis. [Adding a flow-oriented paradigm to commodity operating systems](#). In *Proceedings of the Workshop on Interaction between Operating System and Computer Architecture (IOSCA)*, pages 1–6, Austin, Texas, October 2005.
- [86] Marcio Buss, Stephen A. Edwards, Bin Yao, and Daniel Waddington. [Pointer analysis for source-to-source transformations](#). In *Proceedings of the 5th International Workshop on Source Code Analysis and Manipulation (SCAM)*, pages 139–148, Budapest, Hungary, September 2005. $18/48 = 38\%$.

- [87] Cristian Soviani, Olivier Tardieu, and Stephen A. Edwards. High-level optimization by combining retiming and Shannon decomposition. In *Proceedings of the International Workshop on Logic Synthesis (IWLS)*, pages 16–23, Lake Arrowhead, California, June 2005. 33/67 = 49%.
- [88] Cristian Soviani and Stephen A. Edwards. Challenges in synthesizing fast control-dominated circuits. In *Proceedings of the International Workshop on Logic Synthesis (IWLS)*, pages 326–332, Lake Arrowhead, California, June 2005. 34 posters/67 = 51%.
- [89] Stephen A. Edwards. SHIM: A language for hardware/software integration. In *Proceedings of Synchronous Languages, Applications, and Programming (SLAP)*, Electronic Notes in Theoretical Computer Science, Edinburgh, Scotland, April 2005. 9/17 = 53%.
- [90] Stephen A. Edwards. SHIM: A language for hardware/software integration. In *Proceedings of SYNCHRON*, Schloss Dagstuhl, Germany, December 2004.
- [91] Stephen A. Edwards. The challenges of hardware synthesis from C-like languages. In *Proceedings of the International Workshop on Logic Synthesis (IWLS)*, pages 509–516, Temecula, California, June 2004. 33 talks/70 = 47%.
- [92] Stephen A. Edwards, Vimal Kapadia, and Michael Halas. [Compiling Esterel into static discrete-event code](#). In *Proceedings of Synchronous Languages, Applications, and Programming (SLAP)*, volume 153(4) of *Electronic Notes in Theoretical Computer Science*, pages 107–121, Barcelona, Spain, March 2004. Elsevier Science. 7/10 = 70%, 12 citations on Google Scholar.
- [93] Stephen A. Edwards. High-level synthesis from the synchronous language Esterel. In *Proceedings of the International Workshop on Logic Synthesis (IWLS)*, New Orleans, Louisiana, June 2002. 22 long talks/80 = 28%. 14 citations on Google Scholar.
- [94] Stephen A. Edwards. [ESUIF: An open Esterel compiler](#). In *Proceedings of Synchronous Languages, Applications, and Programming (SLAP)*, volume 65(5) of *Electronic Notes in Theoretical Computer Science*, page 71, Grenoble, France, April 2002. Elsevier Science. 13/16 = 81%.
- [95] Stephen A. Edwards. [Compiling Esterel into sequential code](#). In *Proceedings of the 7th International Workshop on Hardware/Software Codesign (CODES)*, pages 147–151, Rome, Italy, May 1999. Association for Computing Machinery. 20/90 = 22%.
- [96] Gitanjali Swamy, Stephen Edwards, and Robert Brayton. [Efficient verification and synthesis using design commonalities](#). In *Proceedings of the International Workshop on Logic Synthesis (IWLS)*, Tahoe City, California, May 1997.
- [97] Arlindo L. Oliveira and Stephen Edwards. [Limits of exact algorithms for inference of minimum size finite state machines](#). In *Proceedings of the Seventh Annual Workshop on Algorithmic Learning Theory (ALT)*, volume 1160 of *Lecture Notes in Computer Science*, pages 59–66, Sydney, Australia, October 1996. Springer-Verlag. 16 long + 8 short/41 = 59%.

Theses

- [98] Nalini Vasudevan. *Efficient, Deterministic and Deadlock-free Concurrency*. PhD thesis, Columbia University, New York, New York, USA, March 2011. CUCS–013–11.
- [99] Marcio Buss. *Summary-Based Pointer Analysis Framework for Modular Bug Finding*. PhD thesis, Columbia University, New York, New York, USA, February 2008. CUCS–013–08.

- [100] Jia Zeng. *Partial Evaluation for Code Generation from Domain-Specific Languages*. PhD thesis, Columbia University, New York, New York, USA, November 2007. CUCS-048-07.
- [101] Cristian Soviani. *High Level Synthesis for Packet Processing Pipelines*. PhD thesis, Columbia University, New York, New York, USA, October 2007. CUCS-041-07.
- [102] Stephen Anthony Edwards. *The Specification and Execution of Heterogeneous Synchronous Reactive Systems*. PhD thesis, University of California, Berkeley, May 1997. 44 citations on Google Scholar, Available as UCB/ERL M97/31.
- [103] Stephen Edwards. An Esterel compiler for a synchronous/reactive development system. Master's thesis, University of California, Berkeley, June 1994. Available as UCB/ERL M94/43.

Technical Reports

- [104] Richard Townsend, Martha A. Kim, and Stephen A. Edwards. Hardware in Haskell: Implementing memories in a stream-based world. Technical Report CUCS-017-15, Columbia University, Department of Computer Science, September 2015.
- [105] Kuangya Zhai, Richard Townsend, Lianne Lairmore, Martha A. Kim, and Stephen A. Edwards. Hardware synthesis from a recursive functional language. Technical Report CUCS-007-15, Columbia University, Department of Computer Science, April 2015.
- [106] Stephen A. Edwards. Functioning hardware from functional programs. Technical Report CUCS-027-13, Columbia University, Department of Computer Science, New York, New York, USA, October 2013.
- [107] Stephen A. Edwards. A finer functional Fibonacci on a fast FPGA. Technical Report CUCS-005-13, Columbia University, Department of Computer Science, New York, New York, USA, February 2013.
- [108] Stephen A. Edwards. Reconstructing Pong on an FPGA. Technical Report CUCS-0023-12, Columbia University, Department of Computer Science, New York, New York, USA, December 2012.
- [109] Neil Deshpande and Stephen A. Edwards. Statically unrolling recursion to improve opportunities for parallelism. Technical Report CUCS-011-12, Columbia University, Department of Computer Science, New York, New York, USA, July 2012.
- [110] Stephen A. Edwards. Functional Fibonacci to a fast FPGA. Technical Report CUCS-010-12, Columbia University, Department of Computer Science, New York, New York, USA, June 2012.
- [111] Sungjun Kim, Hiren D. Patel, and Stephen A. Edwards. Using a model checker to determine worst-case execution time. Technical Report CUCS-038-09, Columbia University, Department of Computer Science, New York, New York, USA, September 2009.
- [112] Devesh Dedhia. Example application under PRET environment — programming a MultiMedi-aCard. Technical Report CUCS-005-09, Columbia University, Department of Computer Science, New York, New York, USA, January 2009.
- [113] Stephen A. Edwards. Retrocomputing on an FPGA. *Circuit Cellar*, 233:24–35, December 2009. Not peer-reviewed.

- [114] Keerti Joshi and Delvin Kellebrew. A MPEG decoder in SHIM. Technical Report CUCS-057-08, Columbia University, Department of Computer Science, New York, New York, USA, December 2008.
- [115] Nishant R. Shah. Memory issues in PRET machines. Technical Report CUCS-059-08, Columbia University, Department of Computer Science, New York, New York, USA, December 2008.
- [116] David Lariviere and Stephen A. Edwards. uClinux on the Altera DE2. Technical Report CUCS-055-08, Columbia University, Department of Computer Science, New York, New York, USA, December 2008.
- [117] Ravindra Babu Ganapathi and Stephen A. Edwards. SHIM optimization: Elimination of unstructured loops. Technical Report CUCS-054-08, Columbia University, Department of Computer Science, New York, New York, USA, December 2008.
- [118] Dave Aaron Smith, Nalini Vasudevan, and Stephen Edwards. Static deadlock detection in SHIM with an automata type checking system. Technical Report CUCS-053-08, Columbia University, Department of Computer Science, New York, New York, USA, December 2008.
- [119] Nalini Vasudevan, Olivier Tardieu, Julian Dolby, and Stephen A. Edwards. Analysis of clocks in x10 programs (extended). Technical Report CUCS-052-08, Columbia University, Department of Computer Science, New York, New York, USA, December 2008.
- [120] Ben Lickly, Isaac Liu, Sungjun Kim, Hiren D. Patel, Stephen A. Edwards, and Edward A. Lee. Predictable programming on a precision timed architecture. Technical Report UCB/EECS-2008-40, University of California, Berkeley, April 2008.
- [121] Marcio Buss, Daniel Brand, Vugranam Sreedhar, and Stephen A. Edwards. [A new abstraction for summary-based pointer analysis](#). Technical Report RC24104, IBM, New York, July 2007.
- [122] Chen-Chun Huang, Javier Coca, Yashket Gupta, and Stephen A. Edwards. An implementation of a Renesas H8/300 microprocessor with a cycle-level timing extension. Technical Report CUCS-051-06, Columbia University, Department of Computer Science, New York, New York, USA, December 2006.
- [123] Nalini Vasudevan and Stephen A. Edwards. A JPEG decoder in SHIM. Technical Report CUCS-048-06, Columbia University, Department of Computer Science, New York, New York, USA, December 2006.
- [124] Smridh Thapar, Olivier Tardieu, and Stephen A. Edwards. Arrays in SHIM: A proposal. Technical Report CUCS-047-06, Columbia University, Department of Computer Science, New York, New York, USA, December 2006.
- [125] Stephen A. Edwards and Edward A. Lee. The case for the precision timed (PRET) machine. Technical Report UCB/EECS-2006-149, EECS Department, University of California, Berkeley, November 2006.
- [126] Neesha Subramaniam, Ohan Oda, and Stephen A. Edwards. Macshim: Compiling matlab to a scheduling-independent concurrent language. Technical Report CUCS-038-06, Columbia University, Department of Computer Science, New York, New York, USA, September 2006.
- [127] Olivier Tardieu and Stephen A. Edwards. Specifying confluent processes. Technical Report CUCS-037-06, Columbia University, Department of Computer Science, New York, New York, USA, September 2006.

- [128] Olivier Tardieu and Stephen A. Edwards. Scheduling-independent threads and exceptions in SHIM. Technical Report CUCS-036-06, Columbia University, Department of Computer Science, New York, New York, USA, September 2006.
- [129] Marcio Buss, Stephen A. Edwards, Bin Yao, and Daniel Waddington. Pointer analysis for C programs through AST traversal. Technical Report CUCS-028-05, Columbia University, Department of Computer Science, New York, New York, USA, August 2005.
- [130] Christopher L. Conway, Kedar S. Namjoshi, Dennis Dams, and Stephen A. Edwards. Incremental algorithms for inter-procedural analysis of safety properties. Technical Report CUCS-018-05, Columbia University, Department of Computer Science, New York, New York, USA, July 2005.
- [131] Stephen A. Edwards and Chun Li. Determining interfaces using type inference. Technical Report CUCS-052-04, Columbia University, Department of Computer Science, New York, New York, USA, December 2004.
- [132] Cristian Soviani, Jia Zeng, and Stephen A. Edwards. Sequential challenges in synthesizing Esterel. Technical Report CUCS-051-04, Columbia University, Department of Computer Science, New York, New York, USA, December 2004.
- [133] Stephen A. Edwards. Design and verification languages. Technical Report CUCS-046-04, Columbia University, Department of Computer Science, New York, New York, USA, November 2004.
- [134] Hanoril Estevez and Stephen A. Edwards. Live CD cluster performance. Technical Report CUCS-037-04, Columbia University, Department of Computer Science, New York, New York, USA, October 2004.
- [135] Cristian Soviani, Jia Zeng, and Stephen A. Edwards. Improved controller synthesis from Esterel. Technical Report CUCS-015-04, Columbia University, Department of Computer Science, New York, New York, USA, March 2004.
- [136] Stephen A. Edwards. Design languages for embedded systems. Technical Report CUCS-009-03, Columbia University, Department of Computer Science, New York, New York, USA, May 2003.

Professional Activities

Professional Society Memberships

Senior Member, IEEE	2006–
Member, ACM	2006–
Member, IEEE	1994–2006

Standardization Committees

Vice Chair, IEEE P1778 Esterel Standardization Committee, 2007–2009

Journal Activities

- IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems
Top journal in my area.
Associate Editor 2006–
Guest Editor, special section on the Intl. Workshop on Logic and Synthesis May 2006
Reviewer 1994, 2001–2003, 2006–2009, 2013, 2017–2018
- ACM Transactions on Embedded Computer Systems
Associate Editor 2008–
Reviewer 2004, 2006–2007, 2009–2011, 2016–2018
- IEEE Transactions on Industrial Informatics
Associate Editor 2007–
Reviewer 2009
- EURASIP International Journal of Embedded Systems
Associate Editor 2004–
Reviewer 2007–2010
- IEEE Embedded Systems Letters
Reviewer 2010–
- Real-Time Systems
Reviewer 2010
- Science of Computer Programming
Reviewer 2010–2011, 2018
- Journal of Systems Architecture
Reviewer 2013
- Proceedings of the IEEE
Reviewer 2015

Conference/Workshop Activities

- Design Automation Conference (DAC)
Top conference in my area; 15%-20% paper acceptance rate

- Technical Subcommittee Chair, *Managed four TPC members and 50+ papers.* 2006–2007, 2011
 TPC Member, *Responsible for 30+ paper reviews per year.* 2004–2006, 2012
 Reviewer 1996–2004, 2008–
- Design, Automation, and Test in Europe (DATE)
Second-to-top conference in my area.
 Topic Committee Member 2002–2004, 2007
 - International Conference on Computer-Aided Design (ICCAD)
Third-to-top conference in my area.
 TPC Subcommittee Chair, *Invited to head new embedded systems software track* 2011
 - International Workshop on Logic and Synthesis (IWLS)
Main workshop for logic synthesis, approx. 100 attendees
 Program Chair 2006
 General Chair 2005
 Publicity and Publications Chair 2003–2004
 TPC Member 2003–2009, 2011–2012, 2015, 2017, 2018
 - Embedded Systems Week
 Local Arrangements Chair 2005
 Publicity Chair (EMSOFT conference) 2003–2004
 TPC Member (EMSOFT conference) 2004–2006, 2010, 2013, 2015
 TPC Member (CODES+ISSS conference) 2008, 2009, 2010
 Reviewer (EMSOFT conference) 2008, 2011, 2014, 2016
 - Synchronous Languages, Applications, and Programming (SLAP)
 Steering Committee Member 2006–
 TPC Member 2002–2006
 - Memocode conference
 Program Chair 2007–2008
 Design Contest Chair 2012
 Publicity Chair 2003–2004, 2006
 TPC Member 2003–2007, 2009, 2011–2012, 2017–2018
 Panel Organizer 2009
 - Languages, Compilers, and Techniques for Embedded Systems (LCTES)
 TPC Member 2006, 2010
 - IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS)
 TPC Member 2005, 2006
 - Forum on Specification & Design Languages (FDL) TPC Member 2016, 2017
 - Embedded and Ubiquitous Computing (EUC)
 TPC Member 2006–2008
 - International Conference on Computer Design (ICCD)
 TPC Member 2004–2005
 - Applications of Concurrency to System Design (ACSD)
 TPC Member 2004–2008

- Workshop on Modeling, Validation and Heterogeneity (MoVaH)
TPC Member 2008
- ACM SIGPLAN Workshop on Partial Evaluation and Program Manipulation (PEPM)
TPC Member 2008
- International Conference on Hybrid Systems: Computation and Control (HSCC)
TPC Member 2008
- Language Descriptions Tools, Analysis (LDTA)
TPC Member 2009
- International Conference on Software Language Engineering (SLE)
TPC Member 2009, 2010
- Real-time Systems Symposium (RTSS)
TPC Member 2009
- IEEE Intl. Conf. on Compilers, Architectures, and Synthesis of Embedded Systems (CASES)
TPC Member 2013, 2014

Grant Reviews

NSF: 2002, 2003, 2008, 2010, 2012 (2), 2014 (Panels).

INRIA (French National Research Agency): March 2016

ANR (French National Research Agency): October 2011, March 2013.

DFG (German Excellence Initiative): January 2012.

Paper Reviews

ACM Transactions on Programming Languages and Systems (TOPLAS) 2001

Computer-Aided Verification (CAV) 1996, 2001

Correct Hardware Design and Verification Methods (CHARME) 1999

Design Automation and Test in Europe (DATE) 2001

Formal Aspects of Computing (FAC) 2002

Formal Methods for Industrial Critical Systems (FMICS) 2001

IEEE Transactions on Computers 2003, 2007–2009, 2012, 2015

International Conference on Computer-Aided Design (ICCAD) 1999–2003

International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 1996

IFIP Workshop on Logic & Architecture Synthesis (IWLAS) 1994

Semantic Foundations of Engineering Design Languages (SFEDL) 2004

Sigmetrics 2004

Formal Methods in System Design (FMSD) 2004, 2007

Integration—The VLSI Journal 2004

International Conference on Embedded Software and Systems (ICCESS) 2005, 2008, 2009

Code Generation and Optimization (CGO) 2005

Architectural Support for Programming Languages and Operating Systems (ASPLOS) 2006

Principles of Programming Languages (POPL) 2007, 2013, 2018

Fundamenta Informaticae 2007–2008
 Programming Language Design and Implementation (PLDI) 2008
 IEEE Design and Test of Computers 2008
 International Colloquium on Automata, Languages and Programming (ICALP) 2008
 IEEE Conference on Automation Science and Engineering (CASE) 2008
 Electronics and Telecommunications Research Institute (ETRI) Journal 2008, 2012
 The 6th IFIP Workshop on Software Technologies for Future Embedded & Ubiquitous Systems (SEUS) 2008, 2013
 IEEE Transactions on Very Large Scale Integration Systems (TVLSI) 2008, 2009
 IEEE Transactions on Design Automation of Electronic Systems (TODAES) 2008, 2009, 2011, 2012
 IEEE Transactions on Parallel and Distributed Systems (TPDS) 2018
 Compiler Construction (CC) 2008
 Annual Symposium on Parallelism in Algorithms and Architectures (SPAA) 2011
 Software: Practice and Experience (SPE) 2011
 IEEE International Symposia on Multiple-Valued Logic (ISMVL) 2011
 Computer Languages, Systems & Structures (COMLAN) 2012
 Journal on Computing of the Computer Society of India (CSI) 2013
 Theoretical Computer Science (TCS, a journal) 2014

Invited Talks

Keynotes

Haskell to Hardware and Other Dreams. December 7, 2016
 Presented at Synchron, Bamberg, Germany.

Functioning Hardware from Functional Specifications June 26, 2014
 Presented at Applications of Concurrency to System Design (ASCSD), Tunis, Tunisia.

Compiling Parallel Algorithms to Memory Systems June 2, 2012
 Presented at the 2012 Electronic System Level Synthesis Conf. (ESLsyn), San Francisco, California.

Conferences/Other

The Altair 8800 Computer: The Start of the Personal Computer Revolution. April 11, 2018
 Presented at the CSTA Central NJ Meeting, Princeton, New Jersey.

Functioning Hardware from Functional Specifications November 18, 2014
 Presented at IBM Programming Languages Day, T. J. Watson Research Center, New York.

Functioning Hardware from Functional Specifications July 22, 2014
 Presented at the DIMACS Workshop on Multicore and Cryptography, Hoboken, New Jersey.

Functioning Hardware from Functional Specifications November 18, 2013
 Presented at the SYNCHRON workshop, Schloss Dagstuhl, Germany.

Compiling Parallel Algorithms to Memory Systems May 29, 2012
 Presented at the Resource-Aware Functional Programming (RAWFP) Workshop, Göteborg, Sweden.

From Recursive Functions to Real FPGAs March 4, 2012

- Presented at Compiling Complete Programs into Circuits (CCPC), London, UK.
- High-level Synthesis from Functional Languages
Presented at Synchronics Days, Paris, France. October 19, 2012
- What Do We Do With 10^{12} Transistors? The Case for Precision Timing
Presented at the DSRC TeraChip Workshop, Stanford, California. February 21, 2008
- Verification Challenges in the SHIM Concurrent Language
Invited talk at the Third Northeast Verification Seminar, NEC, Princeton, New Jersey. May 18, 2007
- Verification: What Works and What Does Not?
Panel at the Third Northeast Verification Seminar, NEC, Princeton, New Jersey. May 18, 2007
- Using and Compiling Esterel
Invited Tutorial, Memocode conference, Verona, Italy. July 11th, 2005
- The Future of Embedded Linux.
Panel at C3Expo, New York, NY. June 30, 2005
- Languages for Embedded Systems
Week-long course at National Chiao Tung University, Hsinchu, Taiwan. August 2–6, 2004
- Linux for EDA
Tutorial at the International Conference on Computer-Aided Design (ICCAD), San Jose, California. November 2003
- High-Level Modeling and Validation Methodologies for Embedded Systems:
Bridging the Productivity Gap January 4, 2003
Presented at VLSI Design 2003, New Delhi, India.
With Sandeep K. Shukla, Jean Pierre Talpin, and Rajesh K. Gupta.
- System-on-a-chip and the Coming Design Revolution November 1, 2002
Invited talk at the Emerging Information Technology Conference (EITC), Princeton, New Jersey.
- Scaling the Abstraction Cliff: High-level Languages for System Design March 2001
Tutorial A2 at the Design, Automation and Test in Europe (DATE 2001) Munich, Germany.
- Universities/Industry*
- CPUs, GPUs, and the Rise of Software Parallelism December 16, 2013
Presented at Chalmers University, Göteborg, Sweden, as an introduction to Joel Svensson's PhD Defense.
- Functioning Hardware from Functional Specifications December 17, 2013
Presented at Chalmers University, Göteborg, Sweden.
- Compiling Parallel Algorithms to Memory Systems June 26, 2012
Presented to the PARKAS group, DI, École Normale Supérieure.
- Compiling Parallel Algorithms to Memory Systems April 16, 2012
Presented at Jane Street, New York, NY
- Concurrency and Communication: Lessons from the SHIM Project August 6, 2010
Cambridge University, UK
- Concurrency and Communication: Lessons from the SHIM Project July 23, 2010
Microsoft Research, Cambridge, UK
- Concurrency and Communication: Lessons from the SHIM Project July 5, 2010

University of the Philippines, Manila

Programming Shared Memory Multiprocessors with Deterministic Message-Passing Concurrency:
Compiling SHIM to Pthreads August 8, 2008

National Taiwan University, Taipei, Taiwan

What Do We Do With 10^{12} Transistors? The Case for Precision Timing February 20, 2008
Google, Mountain View, California

Precision-Timed (PRET) Machines January 9, 2007
Altera, San Jose, California

Precision-Timed (PRET) Machines July 6, 2007
National Taiwan University, Taipei, Taiwan

SHIM: A Scheduling-Independent Concurrent Language for Embedded Systems May 10, 2007
Princeton University, New Jersey

SHIM: A Scheduling-Independent Concurrent Language for Embedded Systems April 27, 2007
University of Pennsylvania, Philadelphia

SHIM: A Scheduling-Independent Concurrent Language for Embedded Systems March 16, 2007
MIT, Boston, Massachusetts

SHIM: A Scheduling-Independent Concurrent Language for Embedded Systems March 13, 2007
CEA, Grenoble, France

SHIM: A Scheduling-Independent Concurrent Language for Embedded Systems November 8, 2006
University of California, Berkeley

The Challenges of Hardware Synthesis from C-Like Languages September 18, 2006
ECSI-UBS Workshop on High Level Synthesis, Darmstadt, Germany.

SHIM: A Deterministic Language for Embedded Systems August 28, 2006
SpringSoft, Hsinchu, Taiwan.

SHIM: A Deterministic Language for Embedded Systems August 28, 2006
National Chiao Tung University (NCTU), Hsinchu, Taiwan.

SHIM: A Deterministic Language for Embedded Systems August 23, 2006
Microsoft Research, Bangalore, India.

SHIM: A Deterministic Language for Embedded Systems August 11, 2006
Tsinghua University, Hsinchu, Taiwan.

SHIM: A Deterministic Language for Embedded Systems August 10, 2006
National Taiwan University, Taipei.

SHIM: A Deterministic Language for Embedded Systems August 4, 2006
Seoul National University, Korea.

SHIM: A Deterministic Language for Embedded Systems July 21, 2006
University of Kiel, Germany.

SHIM: A Deterministic Model for Heterogeneous Embedded Systems December 9, 2005
Verimag, Grenoble, France.

SHIM: A Deterministic Model for Heterogeneous Embedded Systems November 10, 2005
University of California at Berkeley.

SHIM: A Deterministic Model for Heterogeneous Embedded Systems Xilinx, San Jose, California.	November 9, 2005
SHIM: A Deterministic Model for Heterogeneous Embedded Systems National Instruments and the University of Texas at Austin.	October 7th, 2005
SHIM: A Deterministic Model for Heterogeneous Embedded Systems Tsinghua University, Hsinchu, Taiwan.	August 16th, 2005
Deterministic Receptive Processes are Kahn Processes. INRIA, Sophia-Antipolis, France.	June 22, 2005
SHIM: A Language for Hardware/Software Integration. University of California, Irvine.	April 7, 2005
Using and Compiling Esterel National Chung Cheng University, Chai-Yi, Taiwan.	August 17, 2004
Making cyclic circuits acyclic Carnegie Mellon, Pittsburgh.	March 3, 2003
Compiling Esterel Indian Institute of Technology, Delhi.	January 13, 2003
Compiling Esterel into Better Circuits and Faster Simulations. Intel, Hillsboro, Oregon.	November 5, 2002
Compiling Esterel Cambridge University, UK.	October 10, 2002
Compiling Esterel University of California, Berkeley.	September 5, 2002
Compiling Esterel University of Calgary, Alberta, Canada.	August 26, 2002
Compiling Esterel Microsoft Research, Redmond, Washington.	August 19, 2002
High-level Synthesis from the Synchronous Language Esterel Intel, Hillsboro, Oregon.	August 8, 2002
An Overview of the Electronic Design Automation (EDA) Field Yuan Ze University, Chungli, Taiwan.	July 16, 2002
Compiling Esterel National Taiwan University (Taida), Taipei, Taiwan.	July 8, 2002
Compiling Esterel A discussion of my first Esterel compiler along with ongoing work on ESUIF. Princeton, New Jersey.	April 2002
ESUIF: An Open Esterel Compiler A work-in-progress description of the ESUIF Esterel compiler. IRISA/INRIA Rennes, France.	March 2002
Esterel and Other Projects A summary of existing Esterel work and future plans Intel, Hillsboro, Oregon.	October 2001

Compiling Esterel into Sequential Code,
University of California, Berkeley, CAD Group Seminar.

April 28, 1999

Synchronous Reactive Systems.
University of Texas, Austin.

February 1997

Outreach Activities

Science Expo at the School at Columbia University
Workshop for K-8 students about the innards of computers

April 14, 2018

Engineering Exploration Experience Workshop
Introductory workshop on Arduino programming for high school girls (about 45) organized by Columbia's
Society of Women Engineers

March 24, 2018

Science Expo at the School at Columbia University
Workshop for K-8 students about the innards of computers

February 6, 2016

Science Expo at the School at Columbia University
Workshop for K-8 students about the innards of computers

February 8, 2014

Departmental

Ph.D Students

Richard Townsend	Fall 2013–present
Kuangya Zhai	Fall 2013–Spring 2016
Baolin Shao	Fall 2008–Fall 2010
Sungjun Kim	Spring 2008–Fall 2011
Kristina Chodorow	Fall 2007
Nalini Vasudevan	Spring 2007–Fall 2010
Marcio Buss	Spring 2004–Spring 2008
Jia Zeng	Fall 2002–Spring 2008
Cristian Soviani	Fall 2002–Fall 2007
Christopher L. Conway	Summer 2002–Spring 2006

Postdoctoral Researcher

Olivier Tardieu	Spring 2005–Fall 2006
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External PhD Committees

Adrien Guatto, École Normale Supérieure, Paris, France	January 2016
Joel Svensson, Chalmers University, Göteborg, Sweden	December 2013
Francesco Leonardi, University of Trento, Italy	March 2009
Jan Lukoschus, University of Kiel, Germany	July 2006
Matthieu Moy, Verimag, Grenoble, France	December 2005
Olivier Tardieu, Ecole des Mines, Sophia-Antipolis, France	October 2004
“Jacky” Dumitru Potop-Butucaru, Ecole des Mines, Sophia-Antipolis, France	November 2002
Sean Gibb, University of Calgary, Alberta, Canada	August 2002

Internal Dissertation Defenses

Leon Wu (Gail Kaiser)	September 15, 2014
Richard Neil (Luca Carloni)	May 30th, 2013
Rebecca Collins (Luca Carloni)	November 23, 2010
Cheng-Hong Li (Luca Carloni)	July 22, 2009
Cheoljoo Jeong (Steve Nowick)	October 22, 2007
Cristian Soviani	August 30, 2007

Jia Zeng	August 30, 2007
Krysta Svore (Al Aho)	March 31, 2006
Saravanan Rajapandian (Ken Shepard, EE)	May 20, 2005
Tiberiu Chelcea (Steve Nowick)	December 8, 2003
Yu Zheng (Ken Shepard, EE)	June 9, 2003
Henry Li (Charles Zukowski, EE)	February 1, 2002
Michael Theobald (Steve Nowick)	December 18, 2001

Internal Thesis Proposal Committees

Andrea Lottarini (Martha Kim)	December 5, 2017
Lisa Wu (Martha Kim)	Friday 22, 2013
Cheng-Hong Li (Luca Carloni)	December 3, 2007
Mark Eaddy (Al Aho)	December 13, 2006
Marcio Buss	April 27, 2006
Jia Zeng	May 2, 2006
Cristian Soviani	May 2, 2006
Krysta Svore (Al Aho)	March 31, 2006
Chris Conway	May 12, 2006

Committees

Ad hoc tenure committees	April, December 2013
Class Scheduling	Spring 2011–
<i>Scheduling all classes taught in the CS department</i>	
PhD Committee	2003–
Academic Committee	2003–
Recruiting	
Hosted one candidate	2002
Hosted two candidates	2004
Hosted three candidates	2007
Hosted one candidate	2008
Hosted three candidates	2016
Visibility Committee	2005
<i>Revamped CS department web page</i>	
Space Committee	2007–2013
<i>Assisted Steve Feiner with assigning students and faculty to offices</i>	

Undergraduate/Masters Research Projects Supervised

Student	Work resulted in		Year
	Tech. Report	Published Paper	
Neil Deshpande	•		2012
Yoonji Shin			2011
Devesh Dedhia	•		2008
Delvin Kelleybrew	•		2008
Keerti Joshi	•		2008
Nishant R. Shah	•		2008
Ravindra Babu Ganapathi	•		2008
Dave A. Smith	•		2008
Phong Pham			2007
Haim Cohen		•	2006
Chen-Chun Huang	•		2006
Javier Coca	•		2006
Yashket Gupta	•		2006
Wei Chung Hsu	•		2006
David Lariviere	•		2006
Smridh Thapar	•		2006
Nalini Vasudevan	•		2006
Neesha Subramaniam	•		2006
Ohan Oda	•		2006
Bryan Gwin			2006
Mukul Khajanchi		•	2006
Rebecca Plummer		•	2005
Nicholas Ip		•	2005
Chun Li	•		2004
John Shick			2004
Erin Adelman			2004
Hanoril Estevez	•		2004
Clarke Landis			2003
Noel Vega	•		2003
Michael Anikin			2003
Michael Halas		•	2003
Vimal Kapadia		•	2003
Seema Gupta			2003
Miquad Mohammad			2003
Thomas Heydt-Benjamin	•		2003
Mikhal Litvin			2003
Avi Shinnar		•	2002
Jose Brunheroto			2001

Teaching

In 2011, I developed the **Computer Science/Computer Engineering lab for ENGI E1102**, the new Gateway class. In it, I teach freshman engineering students how to reprogram an HP calculator to function in RPN. The students learn basic C programming, simple algorithms and data structures, and some low-level hardware.

Semester	F 2011	S 2012	F 2012
Enrollment	22	16	27

I teach **CSEE 3827: Fundamentals of Computer Systems**—an introductory digital design and computer architecture course required of all CS, CE, and EE students. *Taught jointly with Martha Kim

Semester	F 2011	S 2012	F 2012
Enrollment	84	114*	74*

Student Comments:

“Professor Edwards is extremely knowledgeable, a great teacher, and very funny. He definitely made class more interesting. His questions were extremely fair although challenging as well.” (Spring 2012)

“I would definitely nominate Professor Edwards for a distinguished faculty award, as he made one of the less interesting subjects in computer science into quite the engaging course. I very much enjoyed his bringing in actual systems that had been developed, and used the components we were learning about in class. His walking us through their design really gave me an appreciation for the difficulties of making a complex computational system prior to the mid-80s.” (Spring 2012)

“Professor Edwards is one of the best professors that I have had at Columbia. He makes what could be a potentially impossible subject, approachable and easy. He is also hilarious, making lectures not only enjoyable at an academic level but also at a comedic one.” (Fall 2011)

“Really freaking good. Made concepts I didn’t understand in previous classes a lot clearer.” (Fall 2011)

“Prof. Edwards was extremely knowledgeable of the material. He made class interesting. His lectures were matched by thorough powerpoint presentations which were helpful in understanding the material. Prof was extremely helpful during office hours and after class in reviewing material and assignments. Great professor.” (Fall 2011)

“Professor Edwards works to teach in an understandable yet memorable way. He works to come up with new examples and analogies to drive points home, and he is helpful to the max. A groovy Professor, all around!” (Fall 2011)

I developed **CSEE W4840: Embedded System Design**—a new “capstone” lab course for Computer Engineering and Electrical Engineering majors. Seniors are required to take one of three such courses. In it, students design and implement embedded systems using state-of-the-art FPGA boards. Projects have included video games, music synthesizers, and robots.

Semester	Sp 2012							
Enrollment	55							
Semester	Sp 2004	Sp 2005	Sp 2006	Sp 2007	Sp 2008	Sp 2009	Sp 2010	Sp 2011
Enrollment	57	45	40	34	25	28	23	37

Student comments:

“Professor Edwards is awesome! Second-best professor I’ve had at Columbia. And he’s only second best

b/c professor Vallancourt is a god.” (Spring 2012)

“Stephen Edwards has very good teaching skills. He never misses an occasion to help students with their projects. He does not count his time. He is always really clear and go straight to the point. We clearly see that he knows what he is talking about. Excellent professor” (Spring 2012)

“Professor Edwards requires quite a bit from his students, but is always available and expends the necessary effort to show you what needs to be done to succeed. I’ve had him for two courses now, and find him to be a knowledgeable and thoughtful professor.” (Spring 2011)

“Stephen is well prepared during lectures and very helpful with projects. I wouldn’t want anything else from an Embedded Systems professor.” (Spring 2011)

“Prof. Edwards is an amazing teacher. I have always enjoyed his lectures.” (Spring 2007)

“His in class presentation is the best I have seen. He is approachable by students and always gives a straight answer to his students. Finally he takes an interest in what the student is doing though out the course.” (Spring 2007)

“Professor Edwards is a very knowledgeable teacher who keeps the classroom interesting and moreover is very help in one-on-one lab settings. He has a genuine interest in what you are trying to accomplish and this is a first that I have seen among all Columbia professors during my 4 years here. To me he seems like the epitome of what a teacher should be.” (Spring 2006)

“I’ve always found Prof. Edwards to bring passion and energy to his lectures. He makes it easy to want to learn more.” (Spring 2006)

“For the time and effort he puts into his presentations and labs. Edwards and his TAs do almost as much work as the students.” (Spring 2005)

I also teach **COMS W4115: Programming Languages and Translators**, a senior/masters compilers class:

Semester	F 2008	F 2010	F 2011	F 2012				
Enrollment	64	61	70	105				
Semester	Sp 2002	Sp 2003	F 2003	F 2004	F 2005	F 2006	Sp 2007	F 2007
Enrollment	107	86	58	52	59	55	58	68

Student comments:

“Professor Edwards has an amazing way in explaining both the broad concepts as well as in-depth details. His preparation for the course couldn’t have been better. Each homework was just in place (either prepared us for the mid-term, final or for starting the project) His presentation skills made one attentive throughout the lectures. He has an excellent way of delivery.” (Fall 2011)

“Professor Edwards was absolutely incredible and I almost failed.” (Fall 2006)

“Professor Edwards is the most accessible instructor I’ve ever had - and he teaches a class about compilers. He’s an amazing man.” (Fall 2006)

“His classes are extremely enjoyable the best course I have taken so far.” (Fall 2006)

“Of the four courses that I took this semester all had good professors but Stephen Edwards was outstanding in his delivery, his ability to use wit [made] his material interesting, and in the quality of the notes and management of the course. I would therefore give him my vote for the Distinguished Faculty award.” (Fall 2006)

“This is a course that I did not really want to take and have little aptitude for. Professor Edwards turned something which could have been very uninteresting into something lively and interesting—this is something I really appreciate.” (Fall 2006)

“Great professor made subject interesting and explained difficult concepts well. I felt like I even learned from the exams.” (Fall 2005)

“Now I know why people call [him] one of the best professors. His wit in the class just make everyone fall into the class.” (Fall 2005)

“Prof. Edwards is one of the few lecturers I’ve met who actually makes the classes very interesting. He’s always inserting funny anecdotes and ties in stories with concepts really well. It s been a pleasure to take PLT with him. Even outside the classroom Prof. Edwards is very friendly and fun to talk to. Would definitely be happy to see him get the SEAS Distinguished Faculty Award.” (Fall 2005)

“Edwards was a great lecturer a great motivator and created a great class. The class was so formative in my CS educational career that I would consider it the most valuable and one of the most interesting.” (Fall 2005)

“His demeanor inside and outside of the classroom is truly one of the greatest I have seen in my four years at Columbia. It is one of the few classes in the engineering school I look forward to going to everyday just to see what he’ll talk about next.” (Fall 2005)

“Prof. Edwards is a great lecturer and really knows his stuff. The class is really well organized.” (Fall 2004)

“One of the best and most useful classes I have ever taken in the CS department.” (Fall 2004)

“I really enjoyed the classroom delivery. The professor did a great job in explaining the concepts. I never felt lost in the material.” (Fall 2004)

COMS W4995–02: Languages for Embedded System Design

Graduate-level class of my own devising based on my book.

Semester	F 2001	F 2002
Enrollment	23	16

Student Teaching

University of California, Berkeley 1995
Head teaching assistant.

Supervised seven teaching assistants overseeing a 200-student upper-division logic design course (CS 150, taught by Richard Newton). Designed and wrote labs. Conducted weekly recitation section, gave substitute lectures to entire class, graded tests.

California Institute of Technology 1990–1992
Teaching assistant.

Wrote assignments and conducted a recitation section for the 30-student microprocessor design course (CS 51, 52, and 53). Designed sound I/O circuitry and PC board for class project.