

Rastislav Bodik

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RESEARCH INTERESTS

Programming systems: program synthesis, parallelizing web browsers, language design, static and dynamic program analysis, mining software artifacts, virtual machines, performance analysis, hardware support for program analysis and compilation.

EDUCATION

PhD in Computer Science 1999
University of Pittsburgh, Pittsburgh, PA

Diploma in Computer Engineering 1992
Technical University, Kosice, Slovakia

POSITIONS

Associate Professor July 2007 – present
Computer Science, University of California, Berkeley

Assistant Professor August 2002 – present
Computer Science, University of California, Berkeley

Academic Visitor August 2002 – December 2002
IBM T.J. Watson Research Center, Hawthorne, NY

Assistant Professor November 1999 – July 2002
Computer Sciences, University of Wisconsin–Madison

AWARDS

- **IEEE MICRO Top Pics from Computer Architecture Conferences** 2004, 2006
- **Best Paper Award, PLDI 2005** 2005
- **Hellman Family Faculty Fund Award, UC Berkeley** 2005
- **HPC Software Challenge (Honorable Mention), Supercomputing** 2004
- **Okawa Research Grant** 2004
- Paper *Complete Removal of Redundant Expressions* selected for **20 Years of PLDI** 2002
- **Students' Choice Professor of the Year Award, UW, Computer Sciences** 2001
- **NSF CAREER** 2001
- **ACM SIGPLAN Doctoral Dissertation Award** 2001
- **Carolyn Rosner Excellent Educator Award, UW, Computer Sciences** 2000
- **IBM Faculty Partnership Award** 2000 to 2002
- **Taulbee Award for Teaching and Research Excellence, Un. of Pittsburgh, C.S.** 1996
- **Mellon Predoctoral Fellowship, University of Pittsburgh** 1994 and 1995

PUBLICATIONS

Journal papers

- Rastislav Bodik, Rajiv Gupta, “Array Data-Flow Analysis for Load-Store Optimizations in Fine-Grain Architectures,” *International Journal of Parallel Programming*, Vol. 24, No. 6, pages 481–512, 1996.
- Brian A. Fields, Rastislav Bodik, Mark D. Hill, Chris J. Newburn, “Interaction Cost and Shotgun Profiling,” *ACM Transactions on Architecture and Code Optimization (TACO)* Volume 1, Issue 3, pages 272–304, September 2004.
- Brian A. Fields, Rastislav Bodik, Mark D. Hill, and Chris J. Newburn, “Interaction Cost: For when event counts just don’t add up,” *IEEE Micro Special Issue: Micro’s Top Picks from Microarchitecture Conferences*, Volume 24, Issue 6, Pages 57–61, November–December 2004.
- Min Xu, Rastislav Bodik, and Mark D. Hill, “A hardware memory race recorder for deterministic replay,” (MICRO Top Picks), *IEEE Micro*, vol. 27, no. 1, pp. 48–55, Jan. 2007.

Refereed conference and workshop papers

- LCPC '95 Rastislav Bodik, Rajiv Gupta, “Array Data-Flow Analysis for Load-Store Optimizations in Superscalar Architectures,” *The Eighth Annual Workshop on Languages and Compilers for Parallel Computing*, Columbus, August 1995.
- Invited for special submission to *International Journal of Parallel Programming*.
- SPDP '95 Rajiv Gupta, Rastislav Bodik, “Adaptive Loop Transformations for Scientific Programs,” *IEEE Symposium on Parallel and Distributed Processing*, San Antonio, October 1995.
- PLDI '97 Rastislav Bodik, Rajiv Gupta, “Partial Dead Code Elimination using Slicing Transformations,” *ACM SIGPLAN Conference on Programming Language Design and Implementation*, Las Vegas, June 1997.
- PLDI '97 Rastislav Bodik, Rajiv Gupta, Mary Lou Soffa, “Interprocedural Conditional Branch Elimination,” *ACM SIGPLAN Conference on Programming Language Design and Implementation*, Las Vegas, June 1997.
- FSE '97 Rastislav Bodik, Rajiv Gupta, Mary Lou Soffa, “Refining Data Flow Information using Infeasible Paths,” *ACM SIGSOFT Symposium on Foundations of Software Engineering*, Zurich, Switzerland, September 1997.
- POPL '98 Rastislav Bodik, Sadun Anik, “Path-Sensitive Value-Flow Analysis,” *ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, San Diego, January 1998.
- PLDI '98 Rastislav Bodik, Rajiv Gupta, Mary Lou Soffa, “Complete Removal of Redundant Expressions,” *ACM SIGPLAN Conference on Programming Language Design and Implementation*, Montreal, June 1998.
- CC '99 Rajiv Gupta, Rastislav Bodik, “Register-Pressure-Sensitive Redundancy Elim-

- ination,” to appear in *International Conference on Compiler Construction*, Amsterdam, Netherlands, March 1999.
- PLDI '99 Rastislav Bodik, Rajiv Gupta, Mary Lou Soffa, “Load-Reuse Analysis: Design and Evaluation,” *ACM SIGPLAN Conference on Programming Language Design and Implementation*, Atlanta, May 1999.
- PLDI '00 Rastislav Bodik, Rajiv Gupta, Vivek Sarkar, “ABCD: Eliminating Array Bounds Checks on Demand,” *ACM SIGPLAN Conference on Programming Language Design and Implementation*, pp. 321–333, Vancouver, June 2000.
- FDDO '00 Subbu Sastry, Rastislav Bodik, James E. Smith, “Characterizing Coarse-Grain Reuse of Computations,” *Proc. 3rd ACM Workshop on Feedback-Directed and Dynamic Optimization (FDDO-3)*, pp. 1-10, December 2000.
- ISCA '01 Brian Fields, Shai Rubin, Rastislav Bodik, “Focusing Processor Policies via Critical-Path Prediction,” *ACM SIGARCH 28th Annual International Symposium on Computer Architecture*, Göteborg, Sweden, June 2001.
- ISCA '01 Subbu Sastry, Rastislav Bodik, James E. Smith, “Rapid Profiling via Stratified Sampling,” *ACM SIGARCH 28th Annual International Symposium on Computer Architecture*, Göteborg, Sweden, June 2001.
- POPL '02 Glenn Ammons, Rastislav Bodik, James R. Larus, “Mining Specifications,” *ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, Portland, OR, January 2002.
- POPL '02 Shai Rubin, Trishul Chilimbi, Rastislav Bodik, “An Efficient Profile-Analysis Framework for Data Layout Optimizations,” *ACM SIGPLAN-SIGACT Symposium on Principles of Programming Languages*, Portland, OR, January 2002.
- ISCA '02 Brian Fields, Rastislav Bodik, Mark D. Hill, “Slack: Maximizing Performance under Technological Constraints,” in *ACM SIGARCH 29th Annual International Symposium on Computer Architecture*, Anchorage, Alaska, May 2002.
- PLDI '03 Glenn Ammons, David Mandelin, Rastislav Bodik, James Larus, “Debugging Temporal Specifications with Concept Analysis,” in *ACM SIGPLAN Conference on Programming Language Design and Implementation*, San Diego, CA, June 2003.
- ISCA '03 Min Xu, Rastislav Bodik, Mark D. Hill, “A “Flight Data Recorder” for Enabling Full-system Multiprocessor Deterministic Replay,” in *ACM SIGARCH 30th Annual International Symposium on Computer Architecture*, San Diego, CA, June 2003.
- MICRO '03 Brian Fields, Rastislav Bodik, Mark D. Hill, C.J. Newburn, “Microarchitectural bottleneck analysis using interaction costs,” in *The 36th Annual IEEE/ACM International Symposium on Microarchitecture*, San Diego, CA, December 2003.
- ▶ Selected to 2004 IEEE Top Pics from Computer Architecture Conferences.
 - ▶ Invited to a special issue of the ACM TACO Journal.
- P-PHEC '04 Armando Solar-Lezama, Rastislav Bodik, “Templating Transformations for Bitstream Programs,” in *HPCA Workshop on Productivity and Performance in*

High-End Computing (P-PHEC 2004), Madrid, Spain, February, 2004.

- PLDI '05 David Mandelin, Lin Xu, Rastislav Bodik, Doug Kimelman, "Mining Jungles: Helping to Navigate the API Jungle," in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'05)*, Chicago, IL, June 2005.
- PLDI '05 Armando Solar-Lezama, Rodric Rabbah, Rastislav Bodik, Kemal Ebcioglu, "Programming by Sketching for Bitstreaming Programs," in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'05)*, Chicago, IL, June 2005.
- *Best Paper Award.*
- PLDI '05 Min Xu, Rastislav Bodik, Mark D. Hill, "Serializability Violation Detector for Shared-Memory Server Programs," in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'05)*, Chicago, IL, June 2005.
- OOPSLA '05 AJ Shankar, S.Subramanya Sastry, Rastislav Bodik, James E. Smith "Runtime Specialization With Optimistic Heap Analysis," 20th Annual ACM Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA '05) San Diego, CA, October 2005.
- OOPSLA '05 Manu Sridharan, Denis Gopan, Lexin Shan, Rastislav Bodik, "Demand-Driven Points-to Analysis for Java," in 20th Annual ACM Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA '05) San Diego, CA, October 2005.
- PLDI '06 Manu Sridharan and Rastislav Bodik, "Refinement-Based Context-Sensitive Points-To Analysis for Java" in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI 2006)*, Ottawa, Canada, June 10–16, 2006.
- ASPLOS '06 Armando Solar-Lezama, Liviu Tancau, Rastislav Bodik, Vijay Saraswat and Sanjit Seshia, "Combinatorial Sketching for Finite Programs," in *12th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2006)*, San Jose, CA, October 2006.
- ASPLOS '06 Min Xu, Rastislav Bodik and Mark D. Hill, "A Regulated Transitive Reduction for Longer Memory Race Recording," in *12th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS 2006)*, San Jose, CA, October 2006.
- PLDI '07 AJ Shankar, Rastislav Bodik, "Ditto: Automatic Incrementalization of Data Structure Invariant Checks," in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'07)*, San Diego, CA, June 2007.
- PLDI '07 Armando Solar-Lezama, Gilad Arnold, Liviu Tancau, Rastislav Bodik, Vijay Saraswat, Sanjit Seshia, "Sketching Stencils," in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'07)*, San Diego, CA, June 2007.
- PLDI '07 Manu Sridharan, Rastislav Bodik, Stephen Fink, "Thin Slicing," in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'07)*,

San Diego, CA, June 2007.

- PPoPP '08 Satish Chandra, Vijay Saraswat, Vivek Sarkar, Rastislav Bodik, "Type Inference for Locality Analysis of Distributed Data Structures," in *ACM SIGPLAN Symposium on Principles and Practice of Parallel Programming*, Salt Lake City, Utah, February 2008.
- PLDI '08 Armando Solar-Lezama, Chris Jones, Rastislav Bodik, "Sketching Concurrent Data Structures," in *ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI'08)*, Tuscon, AZ, June 2008.
- OOPSLA '08 Ajeet Shankar, Matthew Arnold, Rastislav Bodik, "Jolt: Lightweight Dynamic Analysis and Removal of Object Churn," in *ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA 2008)*, Nashville, TN, October 2008.

Other refereed publications

- Rastislav Bodik, Rajiv Gupta, Mary Lou Soffa, "A retrospective on 'Complete Removal of Redundant Expressions'," in *Best of PLDI: 20 Years of the ACM SIGPLAN Conference on Programming Language Design and Implementation 1979-1999, A Selection*, ACM SIGPLAN Notices Volume 39, Issue 4 (April 2004)
- Armando Solar-Lezama, Rastislav Bodik, Kemal Ebcioglu, Rodric Rabbah, Vivek Sarkar, "Highly Productive Collaborations in Bit-Streaming Applications," presented as part of HPC Software Challenge, SC2004, Pittsburgh, PA, 2004
 - ▶ *Honorable Mention.*
- Rastislav Bodik, "Small Languages in an Undergraduate PL/Compiler Course," First SIGPLAN Workshop on Undergraduate Programming Language Curricula, to appear in SIGPLAN Notices.

Non-refereed publications

- K. Asanovic, R. Bodik, B. C. Catanzaro, J. J. Gebis, P. Husbands, K. Keutzer, D. A. Patterson, W. L. Plishker, J. Shalf, S. W. Williams, and K. A. Yelick, "The Landscape of Parallel Computing Research: A View from Berkeley," EECS Department, University of California, Berkeley, Tech. Rep. UCB/EECS-2006-183, Dec. 2006.
- M. Sridharan, S. J. Fink, and R. Bodik, "Thin Slicing," EECS Department, University of California, Berkeley, Tech. Rep. UCB/EECS-2006-184, Dec. 2006.
- K. Asanovic, R. Bodik, J. Demmel, T. Keaveny, K. Keutzer, J. D. Kubiawicz, E. A. Lee, N. Morgan, G. Necula, D. A. Patterson, K. Sen, J. Wawrzynek, D. Wessel, and K. A. Yelick, "The Parallel Computing Laboratory at U.C. Berkeley: A Research Agenda Based on the Berkeley View," EECS Department, University of California, Berkeley, Tech. Rep. UCB/EECS-2008-23, March 2008.

GRANTS

- Principal Investigator, *Scalable Compiler Optimizations for Modern Software*, NSF (CA-

- REER), CCR-0093275, 2000.
- Co-Principal Investigator (with Mark D. Hill), *Exploiting the Critical Path in the Design and Performance Analysis of Modern Processors*, National Science Foundation (Computer Architecture), CCR-0105721, 2001.
 - Co-Principal Investigator (with Andrea Arpaci-Dusseau and Mikko Lipasti), *Wisconsin DOVE: Distributed Optimizing Virtual Environment*, NSF (Next Generation Software), EIA-0103670, 2001.
 - Principal Investigator, subcontract from IBM, *PERCS (Productive, Easy-to-use, Reliable Computing System)*, DARPA (HPCS Phase II), 2003
 - Co-Principal Investigator (with George Necula *et al*), *Language-Based Software Security*, NSF (ITR Medium), CNS-0326577, 2003
 - Co-Principal Investigator (with George Necula), *Tools for Securing Software Infrastructure*, University of California Microelectronics Innovation and Computer Research Opportunities (UC MICRO Program) 2003, 2004
 - Principal Investigator, *Implementing Provably Correct High-Performance Ciphers with Sketching*, NSF (CyberTrust), CNS-0524815, 2005
 - Principal Investigator, IBM, unrestricted donation, *Programming by Sketching*, 2006–2008
 - PI (with David Patterson *et al*), Intel and Microsoft, Universal Parallel Computing Research Center, 2008–2013
 - Principal Investigator (with David Patterson *et al*), UC Discovery, Universal Parallel Computing Research Center 2008–2010
 - Principal Investigator (with Sanjit Seshia), NSF, SoD-TEAM: *Programming by Sketching*, CCF-0613997, 2006–2008
 - UC MICRO, *Programming by Sketching*, 2006
 - UC MICRO, *Programming by Sketching*, 2007

RECENT INVITED TALKS

- Computer Science Colloquium, *Two Techniques for Programming by Sketching*, Brown University, October 2006.
- Invited talk, *Programming by Sketching*, New England Programming Languages and Systems Symposium (NEPLS), October 2006.
- Computer Science Colloquium, *Programming by Sketching*, Cornell University, October 2007.
- Invited talk, *Program Synthesis by Sketching*, ACM SIGPLAN 2008 Workshop on Partial Evaluation and Program Manipulation (PEPM08), January 2008.
- Invited talk, *Browsing Web 3.0 on 3.0 Watts: Why Browsers Will Be Parallel*, Mozilla Corp Engineering All-Hands Week, January 2008.
- Panel presentation, *Why Do We Still Have Bugs? $P=AC^2$* , March 2008.

- Plenary talk, Program Synthesis by Sketching, $P=AC^2$, April 2008.
- Keynote talk, Browsing Web 3.0 on 3.0 Watts: Why Browsers Will Be Parallel and Implications for Education, The 3rd Workshop on Software Tools for MultiCore Systems (STMCS08), April 2008.

PHD STUDENTS, FORMER

- Subbu Sastry, "Techniques for transparent program specialization in dynamic optimizers," (University of Wisconsin, 2003)
- Glenn Ammons, "Strauss: a specification miner," (University of Wisconsin, 2003)
- Min Xu (University of Wisconsin)
- Brian Fields
- Manu Sridharan

PHD STUDENTS, CURRENT

- Gilad Arnold
- Chris Jones
- David Mandelin
- Leo Meyerovich
- A.J. Shankar
- Lexin Shan
- Armando Solar-Lezama

PROFESSIONAL ACTIVITIES

Organizer/Co-organizer

- Workshop Chair, ASPLOS 2006.
- Program Chair, Compiler Construction (CC) 2005.
- Member, Steering Committee of European Joint Conferences on Theory and Practice of Software (ETAPS), 2004–2006.
- Chair, Student Research Forum at ACM SIGPLAN PLDI 2005
- Publications Chair, PACT 2005
- Co-chair, Wild and Crazy Ideas Session at ASPLOS 2002.
- Co-chair, Student Research Forum at PLDI 2002.
- Program Chair, The First ACM OM: Workshop on Optimizing Middleware and Distributed Software, June 2001.

Member of Program Committee

- 17th International Conference on Parallel Architectures and Compilation Techniques

(PACT08)

- Steering Committee for the PL Curricula Workshop, May 2008.
- 13th International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS'08)
- International Symposium on Code Generation and Optimization (CGO07)
- 16th International Conference on Compiler Construction (CC07)
- 6th International ACM SIGPLAN Conference on Generative Programming and Component Engineering (GPCE07)
- ACM SIGPLAN Workshop on Partial Evaluation and Program Manipulation (PEPM07)
- eclipse Technology eXchange (eTX) Workshop at OOPSLA 2005.
- Symposium on Principles of Programming Languages (POPL) 2005.
- Code Generation and Optimization (CGO) 2004.
- International Conference on Compiler Construction 2004.
- Symposium on Principles of Programming Languages (POPL) 2003.
- International Conference on Supercomputing (ICS), June 2002.
- International Conference on Compiler Construction (CC-2002), April 2002.
- Third ACM Workshop on Feedback-Directed and Dynamic Optimization (FDDO-3), December, 2001.
- International Conference on Parallel Architectures and Compilation Techniques (PACT), September, 2001.
- 5th Annual Workshop on Interaction between Compilers and Computer Architectures (INTERACT-5), January, 2001.

Member of Review Panel

- NSF Proposal Review Panel, December 2004.
- NSF Proposal Review Panel, March 2003.
- NSF Proposal Review Panel, 2001.