Curriculum Vitae
Rupak Majumdar

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Research Interests

Logic and automata theory, concurrency, verification and control. Formal methods in software verification. Game theoretic methods in formal verification. Algorithmic issues in the verification and control of reactive, probabilistic, and real-time systems. Program analysis.

Education

May 1998	B.Tech in Computer Science, Indian Institute of Technology, Kanpur
September 2003	Ph.D. in Computer Science, Department of Computer Science, University of California, Berkeley, CA 94720
September 2003	Postdoctoral Researcher, Department of Computer Science, University of California, Berkeley, CA 94720

Employment

November 1, 2003 onwards	Assistant Professor, Department of Computer Science, University of California, Los Angeles, CA 90095

Awards and Honors

1. NSF CAREER Award, 2006.
2. Nominated for ACM Distinguished Dissertation Award, UC Berkeley, 2004.
3. Leon O. Chua Award for Research in Nonlinear Science, Department of EECS, University of California, Berkeley, 2002.

4. Best paper award, 12th International Conference on Concurrency Theory (CONCUR), 2001.
5. Microsoft Research Fellowship, Microsoft Corp, 2001.
6. UC Regent's Fellowship, University of California, Berkeley, 1998.
7. President's Gold Medal, Indian Institute of Technology, Kanpur, 1998.
8. Jawaharlal Nehru Summer Fellowship, Jawaharlal Nehru Center for Advanced Scientific Research, Bangalore, India, 1996, 1997. Rajeev Gandhi Award for best project in Computer Science, 1997.

Software

1. BLAST (http://www.eecs.berkeley.edu/∼blast)
2. jMocha (http://www.eecs.berkeley.edu/∼mocha)
3. The Vampyre Proof-generating Theorem Prover (http://www.cs.ucla.edu/∼rupak/vampyre)

Invited Talks

- "Nash equilibria in stochastic games," Workshop on Games in Design and Verification, 2004.
- "Software verification with Blast," MOVEP: Modeling and Verifying Parallel Processes, Summer School, Brussels, 2004.
- "Counterexample-guided planning," Dagstuhl Workshop on Synthesis and Planning, 2005.
- "Software verification with Blast," SPIN Workshop on Software Model Checking, 2005.
- "Joining dataflow with predicates," Summer Research Institute, EPFL, Lausanne, Switzerland, 2006.
- "The Next Challenges in Software Verification," Stanford University Programming Languages Seminar, 2006. Also at Intel Strategic CAD Labs, 2006.
- "Proofs and counterexamples," Workshop on Satisfiability modulo Theories, Berlin, 2007.
- "Structural Invariants," Summer Research Institute, EPFL, Lausanne, Switzerland, 2007.

Publications

Refereed Journal Publications

[1] T.A. Henzinger, R. Majumdar, and J.-F. Raskin. A classification of symbolic transition systems. In *ACM Transactions on Computational Logic*, 6(1):1–32. 2005.

[2] L. de Alfaro and R. Majumdar. Quantitative Solution of Concurrent Games. In *Journal of Computer and Systems Sciences*, 68, pages 374–397, 2004.

[3] K. Chatterjee, D. Ma, R. Majumdar, T. Zhao, T.A. Henzinger and J. Palsberg. Stack size analysis for interrupt-driven programs. In *Information and Computation*, 194(2): 144–174. 2004.

[4] J.L. Wong, R. Majumdar, and M. Potkonjak. Watermarking of SAT using combinatorial isolation lemmas. In *IEEE Transactions on Computer-Aided Design of Integrated Circuits*, 2004.

[5] T.A. Henzinger, O. Kupferman, and R. Majumdar. On the complexity of the universal and existential μ-calculus. In *Theoretical Computer Science*, 2006.

[6] L. de Alfaro, M. Faella, T.A. Henzinger, R. Majumdar, and M. Stoelinga. Model checking discounted temporal properties. In *Theoretical Computer Science*, 2005.

[7] K. Chatterjee, R. Majumdar, and T.A. Henzinger. Stochastic limit-average games are in EXPTIME. In *International Journal of Game Theory*, to appear.

[8] D. Beyer, T.A. Henzinger, R. Jhala, and R. Majumdar. Software engineering with Blast. In *Software Tools for Technology Transfer*, to appear.

Refereed Conference Publications

[1] R. Majumdar and R.K. Shyamasundar. Design of controllers for linear hybrid systems, In *ASIAN 96: Concurrency and Parallelism, Programming, Networking, and Security: Second Asian Computing Science Conference*, Lecture Notes in Computer Science, vol 1179, pages 309–320, Springer-Verlag, 1996.

[2] T.A. Henzinger, B. Horowitz, and R. Majumdar. Rectangular hybrid games. In *CONCUR 99: Concurrency Theory*, Lecture Notes in Computer Science, vol 1664, pages 320–335, Springer-Verlag, 1999.

[3] T.A. Henzinger, B. Horowitz, R. Majumdar, and H. Wong-Toi. Beyond HyTech: Hybrid Systems Analysis using interval numerical methods. In *HSCC 00: Hybrid Systems: Computation and Control*, Lecture Notes in Computer Science, vol 1790, pages 130–144, Springer-Verlag, 2000. (Preliminary results appeared in *Hybrid Systems and AI:*

Modeling Analysis and Control of Discrete + Continuous Systems, AAAI 99 Spring Symposium Series, 1999).

[4] T.A. Henzinger and R. Majumdar. Symbolic model checking for rectangular hybrid systems. In *TACAS 00: Tools and Algorithms for the Construction and Analysis of Systems*, Lecture Notes in Computer Science, vol 1785, pages 142–156, Springer-Verlag, 2000.

[5] T.A. Henzinger, R. Majumdar, F. Y.-C. Mang, and J.-F. Raskin. Abstract interpretation of game properties. In *SAS 00: Static Analysis Symposium*, Lecture Notes in Computer Science, vol 1824, pages 220–239, Springer-Verlag, 2000.

[6] R. Alur, L. de Alfaro, R. Grosu, T.A. Henzinger, M. Kang, R. Majumdar, F. Mang, C. Meyer-Kirsch, and B.Y. Wang. jMocha: a model-checking tool that exploits design structure. Proceedings of the 23rd Annual IEEE/ACM International Conference on Software Engineering (ICSE 01), ACM Press, pages 64–72, 2001.

[7] L. de Alfaro and R. Majumdar. Quantitative solution of concurrent games. In *Proceedings on 33rd Annual ACM Symposium on Theory of Computing (STOC '01)*, ACM Press, pages 675–683, 2001.

[8] R. Majumdar and J.L. Wong. Watermarking of SAT using combinatorial isolation lemmas. In *Proceedings of the 38th Design Automation Conference (DAC 2001),* ACM Press, pages 480–485, 2001.

[9] T. Ball, R. Majumdar, T. Millstein, and S.K. Rajamani. Automatic predicate abstraction of C programs. In *Proceedings of the 2001 ACM SIGPLAN Conference on Programming Language Design and Implementation (PLDI '01),* ACM Press, page 203–213, 2001.

[10] L. de Alfaro, T.A. Henzinger, and R. Majumdar. From verification and control: dynamic programs for omega-regular properties. In *Proceedings of the 16th Annual Symposium on Logic in Computer Science (LICS 01)*, IEEE Computer Society Press, pages 279–290, 2001.

[11] L. de Alfaro, T.A. Henzinger, and R. Majumdar. Symbolic algorithms for infinite-state games. In *Proceedings of the 12th International Conference on Concurrency Theory (CONCUR 01)*, Lecture Notes in Computer Science 2154, Springer-Verlag, pages 536–550, 2001. Best paper award.

[12] T.A. Henzinger, R. Jhala, R. Majumdar, and G. Sutre. Lazy abstraction. In *Proceedings of the 29th Annual Symposium on Principles of Programming Languages (POPL 02)*, ACM Press, pages 58–70, 2002.

[13] T.A. Henzinger, R. Jhala, R. Majumdar, G.C. Necula, G. Sutre, and W. Weimer. Temporal-safety proofs for systems code. In *Proceedings of the Computer-Aided Verification (CAV 02)*, Lecture Notes in Computer Science 2404, Springer-Verlag, pages 526–538, 2002.

[14] T.A. Henzinger, C. Kirsch, R. Majumdar, and S. Matic. Time safety checking for embedded programs. In *Proceedings of the 2nd Conference on Embedded Software (EMSOFT 02)*, Lecture Notes in Computer Science, Springer-Verlag, pages 76–92, 2002.

[15] T.A. Henzinger, R. Jhala, R. Majumdar, and G. Sutre. Software verification with Blast (Tool Paper). In *SPIN 03: SPIN Model Checking and Software verification*, Lecture Notes in Computer Science 2648. Springer-Verlag, pages 235–239, 2003.

[16] T.A. Henzinger, O. Kupferman, and R. Majumdar. On the universal and existential fragments of the μ-calculus. In *TACAS 03: Tools and Algorithms for the Construction and Analysis of Systems*, Lecture Notes in Computer Science 2619. Springer-Verlag, pages 49–64, 2003.

[17] L. de Alfaro, T.A. Henzinger, and R. Majumdar. Discounting the future in systems theory. In *ICALP 03: International Colloquium on Automata, Languages, and Programming*, Lecture Notes in Computer Science 2719. Springer-Verlag, pages 1022–1037, 2003.

[18] T.A. Henzinger, R. Jhala, and R. Majumdar. Counterexample guided control. In *ICALP 03: International Colloquium on Automata, Languages, and Programming*, Lecture Notes in Computer Science 2719. Springer-Verlag, pages 886–902, 2003.

[19] K. Chatterjee, D. Ma, R. Majumdar, T. Zhao, T.A. Henzinger, and J. Palsberg. Stack size analysis for interrupt driven programs. In *SAS 03: Static Analysis Symposium*, Lecture Notes in Computer Science 2694, Springer-Verlag, pages 109–126, 2003.

[20] L. de Alfaro, M. Faella, T.A. Henzinger, R. Majumdar, and M. Stoelinga. The element of surprise in timed games. In *CONCUR 03: Concurrency Theory*, Lecture Notes in Computer Science 2761. Springer-Verlag, pages 142–156, 2003.

[21] T.A. Henzinger, R. Jhala, R. Majumdar, and S. Qadeer. Thread modular abstraction refinement. In *CAV 03: Computer-Aided Verification*, Lecture Notes in Computer Science 2725. Springer-Verlag, pages 262–274, 2003.

[22] T.A. Henzinger, R. Jhala, R. Majumdar, and K.L. McMillan. Abstractions from proofs. In *POPL 04: Principles of Programming Languages*, ACM press. To appear, 2004.

[23] L. de Alfaro, M. Faella, T.A. Henzinger, R. Majumdar, and M. Stoelinga. Model checking discounted temporal properties. In *TACAS 04: Tools and Algorithms for the Construction and Analysis of Systems*, Lecture Notes in Computer Science. Springer-Verlag, 2004.

[24] D. Beyer, A.J. Chlipala, T.A. Henzinger, R. Jhala, and R. Majumdar. Generating tests from counterexamples. In *ICSE 04: International Conference on Software Engineering*, ACM press. To appear, 2004.

[25] T.A. Henzinger, R. Jhala, and R. Majumdar. Race checking by context inference. In *PLDI 04: Programming Languages Design and Implementation*, ACM press. To appear, 2004.

[26] D. Beyer, T.A. Henzinger, R. Jhala, and R. Majumdar. An Eclipse plug-in for model checking. In *IWPC 04: International Workshop on Program Comprehension*, ACM press. 2004.

[27] K. Chatterjee, R. Majumdar, and M. Jurdzinski. On Nash equilibria in stochastic games. In *CSL 04: Computer Science Logic*, Lecture Notes in Computer Science 3210, pages 26–40. Springer, 2004.

[28] R. Jhala and R. Majumdar. Path slicing. In *PLDI 05: Programming Languages Design and Implementation*, pages 38–47. ACM, 2005.

[29] J. Fischer, R. Jhala, and R. Majumdar. Joining dataflow with predicates. In *FSE 05: Foundations of Software Engineering*, ACM Press, 2005.

[30] T.A. Henzinger, R. Jhala, and R. Majumdar. Permissive interfaces. In *FSE 05: Foundations of Software Engineering*, ACM Press, 2005.

[31] A. Chakrabarti, K. Chatterjee, T.A. Henzinger, O. Kupferman, and R. Majumdar. Verifying quantitative properties using bound functions. In *CHARME 2005*, Springer. 2005.

[32] K. Chatterjee, T.A. Henzinger, R. Jhala, and R. Majumdar. Counterexample-guided planning. In *UAI 2005*.

[33] L. de Alfaro, M. Faella, R. Majumdar, and V. Raman. Code aware resource management. In *EMSOFT 05: Embedded Software*, ACM, 2005.

[34] T.A. Henzinger, R. Majumdar, and V. Prabhu. Quantifying Similarities Between Timed Systems. In *FORMATS 2005*, Springer.

[35] M.J. Emmi and R. Majumdar. Decision problems for model checking real-time software. In *HSCC 06: Hybrid Systems: Computation and Control*, Springer, 2006.

[36] K. Chatterjee, R. Majumdar, and T.A. Henzinger. Markov decision processes with multiple objectives. In *STACS 06: Symposium on Theoretical Aspects of Computer Science*, Springer, 2006.

[37] R. Jhala, R. Majumdar, and R. Xu. Structural invariants. In SAS 06: Static Analysis Symposium, Springer, 2006.

[38] K. Chatterjee, L. de Alfaro, M. Faella, T.A. Henzinger, R. Majumdar, and M. Stoelinga. Compositional quantitative reasoning. In QEST 06, ACM, 2006.

[39] R. Jhala and R. Majumdar. Bit level types for high level reasoning. In FSE 06: Foundations of Software Engineering, ACM, 2006.

[40] D. Kapur, R. Majumdar, and C.G. Zarba. Interpolation for data structures. In FSE 06: Foundations of Software Engineering, ACM, 2006.

[41] R. Jhala and R. Majumdar. The analysis of asynchronous programs. In POPL 07: Principles of Programming Languages, ACM, 2007.

[42] M. Emmi, J. Fischer, R. Jhala, and R. Majumdar. Lock allocation. In POPL 07: Principles of Programming Languages, ACM, 2007.

[43] M. Emmi and R. Majumdar. Verifying compensating transactions. In VMCAI 07: Verification, Model Checking, and Abstract Interpretation, Lecture Notes in Computer Science, Springer-Verlag, 2007.

[44] D. Beyer, T.A. Henzinger, R. Majumdar, and A. Rybalchenko. Invariant Generation for Combined Theories. In VMCAI 07: Verification, Model Checking, and Abstract Interpretation, Lecture Notes in Computer Science, Springer-Verlag, 2007.

[45] R. Jhala, R. Majumdar, and R.-G. Xu. State of the union: Type inference using Craig interpolation. In *TACAS 07: Tools and Algorithms for the Construction and Analysis of Systems*, Lecture Notes in Computer Science, Springer-Verlag, 2007.

[46] L. de Alfaro, R. Majumdar, V. Raman, and M. Stoelinga. Game relations and metrics. In *LICS 07: Logic in Computer Science*, IEEE, 2007.

[47] J. Fischer, R. Majumdar, and T. Millstein. Tasks: Language support for event-driven programming. In *PEPM 07: Partial Evaluation and Program Manipulation*, ACM, 2007.

[48] R. Majumdar and K. Sen. Hybrid concolic testing. In *ICSE 07: International Conference on Software Engineering*, ACM and IEEE, 2007.

[49] D. Beyer, T.A. Henzinger, R. Majumdar, and A. Rybalchenko. Path Invariants. In *PLDI 07: Programming Languages Design and Implementation*, ACM, 2007.

[50] M. Emmi, R. Majumdar, and K. Sen. Dynamic test input generation for database applications. In *ISSTA 07: International Symposium on Software Testing and Analysis*, ACM, 2007.

[51] Y. Hu, V. Shih, L. He, and R. Majumdar. Efficient SAT-Based Boolean Matching for Heterogeneous FPGA Technology Mapping, In *ICCAD 07: International Conference on Computer-Aided Design*, ACM, 2007.

Invited Papers

[1] T.A. Henzinger and R. Majumdar. A classification of symbolic transition systems. In *STACS 00: Theoretical Aspects of Computer Science*, Lecture Notes in Computer Science, vol 1770, pages 13–34, Springer-Verlag, 2000.

[2] T.A. Henzinger, R. Jhala, R. Majumdar, and M.A.A. Sanvido. Extreme model checking. In *Proceedings of the International Symposium on Verification (Theory and Practice): Celebrating Zohar Manna's 64-th Birthday*, Lecture Notes in Computer Science 2722, pages 332–358, 2003.

[3] D. Beyer, A. Chlipala, T.A. Henzinger, R. Jhala, and R. Majumdar. The Blast query language for software verification. In *SAS 04: Static Analysis Symposium*, Lecture Notes in Computer Science. Springer, 2004.

[4] D. Beyer, T.A. Henzinger, R. Jhala, and R. Majumdar. Checking memory safety with Blast. In *FASE 05: Fundamental Approaches to Software Engineering*, 2005.

[5] T.A. Henzinger, R. Jhala, and R. Majumdar. Software verification with BLAST. In *SPIN 05: Software Model Checking*, Springer. 2005.

Patents

US Patent 7058925: System and method for generating a predicate abstraction of a program.

Professional Activities

Teaching and Organization

- CS284 Advanced Automata Theory (Graduate class).
- CS234 Computer-Aided Verification (Graduate class).
- CS239 Topics in Software Verification (Graduate class).
- CS181 Formal Languages and Automata Theory (Undergraduate class).

Program Committees

- SAVCBS 2004: Workshop on Specification and Verification of Component-based Systems.
- CAV 2005: Conference on Computer-Aided Verification.
- SPIN 2005: SPIN Workshop on Software Verification.
- GDV 2005: Games in Design and Verification (Program co-Chair).
- SEFM 2006: Software engineering and formal methods.
- CSL 2007: Computer Science Logic.
- FORMATS 2007: Formal Methods for Timed Systems.
- SPIN 2008: Software Model Checking (Program co-Chair).

Referee

Journals. Theoretical Computer Science, ACM Transactions on Programming Languages and Systems, ACM Transactions on Computational Logic, Journal of Computer and Systems Sciences, Journal of the ACM, Software Tools for Technology Transfer, Logical Methods in Computer Science.
National Science Foundation panels.

Students

Jeffrey Fischer, Ru-Gang Xu, Rafit Izhak-Ratzin, Michael Emmi.
Graduated: Manav Mital (now at Yahoo).