

# Curriculum Vitae

Ruben A. Gamboa

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## Degrees

- The University of Texas** Austin, TX 1999  
Ph.D. in Computer Science  
Thesis: *Mechanically Verifying Real-Valued Algorithms in ACL2*  
Advisor: Robert S. Boyer
- Texas A&M University** College Station, TX 1986  
M.C.S. in Computer Science, minor in Mathematics  
Thesis: *Lower Bounds on Approximation Algorithms*  
Advisor: Donald K. Friesen
- Angelo State University** San Angelo, TX 1984  
B.S. in Computer Science, minor in Mathematics  
Magna cum Laude

## Experience

### Academic Experience

- Associate Professor** (promoted in 2007) 2002–Present  
University of Wyoming  
Taught and developed a wide range of upper-division and graduate courses in computer science, as well as special courses for UW's honors program. Supervised graduate and undergraduate theses. Served in many different committees, including search committees, the tenure and promotion committee, the ABET/CSAB certification committee, and the graduate committee.
- Adjunct Professor** 2001  
The University of Texas at Austin  
Taught the sophomore course Analysis of Programs, which introduces students to formal reasoning about programs and common data structures.
- Lecturer** 1987  
Texas A&M University  
Taught the senior course in Programming Languages.
- Graduate Assistant, Non-Teaching** 1986–1987  
Texas A&M University  
System Administrator for the Computer Science Department.
- Graduate Assistant, Teaching** 1984–1985  
Texas A&M University  
Taught various introductory programming courses, primarily for engineering majors.

**Industrial Experience**

- Member, Technical Advisory Board** 2000–Present  
 Logical Information Machines, Inc. (LIM)  
 Provide continuing advise in the technical direction of LIM, including new technologies and new products that use LIM's existing technologies.
- Training Consultant** 2000–Present  
 InferData, Ltd.  
 Develop training materials and deliver courses in a wide range of topics, including J2EE, Ruby on Rails, PHP, Python, Ajax, Dojo, XML, SOA, Flex, mashups, and other Web 2.0 technologies.
- V.P. of Engineering** 2000–2001  
 Loop One, Inc.  
 Designed and implemented Loop One's web service offering, which was based on mod\_perl, Java, HTML, JavaScript, and Oracle's PL/SQL.
- Director and Founder** 1990–2000  
 Logical Information Machines, Inc. (LIM)  
 Founder, first employee, and member of the board of directors of LIM, a leading supplier of time-series databases, applications, and data for the financial and energy markets.
- Senior Architect and Fellow** 1990–2000  
 Logical Information Machines, Inc. (LIM)  
 Designed and developed LIM's time-series database server and execution engine, based on linear temporal logic. LIM's time-series database technology, ranked as the best in the world by the Gartner Group, was developed in C++, Java, Lisp, Perl, and Oracle.
- Junior Member, Technical Staff** 1988–1989  
 MCC, Deductive Computing Laboratory  
 Designed and implemented an in-memory database system for *SACAD*, an implementation of the deductive database *LDL*.

**Courses Taught****Undergraduate Courses**

Algorithms and Data Structures  
 Software Engineering  
 Computer Graphics  
 Computer Networks  
 Compiler Construction  
 Senior Design (capstone course)  
 Software Design\*  
 Game Programming\*  
 Enterprise Programming\*  
 Distributed Computing for Cryptography\*

**Graduate Courses**

Automated Reasoning\*  
 Automated Programming\*  
 Grid Computing for Scientific Applications\*

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\*Course was completely designed and developed by instructor.

**Honors Courses**

Understanding the Digital Society\*

Silicon Artists: Machines Who Paint, Compose, Perform, and Write\*

**Student Advising****Ph.D. Students**

Nadezda Kuzmina. She is working on a tool and methods that will allow programmers to extract constrained models from programs automatically. Her tool is based on the Daikon constraint extraction tool and ABSINT, an abstract interpreter developed at the University of Wyoming. This work is partially sponsored by NSF CNS-0613919.

**M.S. Students**

Matt Williams. He is studying the effect of Ruby's language features on good software engineering practice.

Lei Wu. He is working on a formal verification in ACL2(r) of the relationship between the geometric and the analytic definitions of the trigonometric functions.

Andrey Nifatov. Graduated spring of 2007. Thesis: "Training of Neural Networks on a Grid Architecture."

Divya Sethi. Graduated fall of 2006. Thesis: "Using Data Access Objects to Achieve Database Independence."

Todd Bolinger. Graduated spring of 2006. Thesis: "Scientific Visualization of Galaxy Behavior using Grid Architecture."

Edouard Havugimana. Graduated fall of 2004. Thesis: "Analysis of Online Transaction Security."

**Committee Member**

Christoph Jechlitschek, M.S., 2004.

Craig Unrein, M.S., 2007.

Jung Kim, Ph.D., 2008.

Sunil Kothari, Ph.D.

John Paul, Ph.D.

Josef Paul, Ph.D.

Anthony Wallace, Ph.D.

Sabrina Lyn Cales, Ph.D. (Astronomy).

Eric Hoversten, M.A. (Philosophy), 2008.

**Undergraduate Students**

Matt Williams and Tyler Clayton. Seniors Honors Project. "Falsity: A Multiplayer Game Engine." 2005.

Benjamin Ketron. Seniors Honors Project. "Tool to aid in learning phrase structure parsing trees." 2005.

**Undergraduate Research**

Melissa Wiederrecht. Formal reasoning about programs in Scheme. 2008–2009.

Carla Elder, Drew Hauser, Karl Heimbeck, Maurisa Jensen, Kelley O’Toole, Heather Robinson. Cryptography Cohort, funded by NSF DMS-0639325. 2008–2009.

Tyler Branyan, Andrew Kreeger, Christopher MacLellan, Brian Moler, Daniel Peterson, Melissa Wiederrecht. Cryptography Cohort, funded by NSF DMS-0639325. 2007–2008.

Heather Aust and Yuki Kawabe. Comprehensibility of Design, funded by NSF CNS-0752944. 2007–2008.

**U.S. Patents**

**No. 5,778,357** 1998  
*Market Information Machine*

**No. 5,590,325** 1996  
*System for Forming Queries to a Commodities Trading Database Using Analog Indicators*

**No. 5,414,838** 1995  
*System for Extracting Historical Market Information with Condition and Attributed Windows*

**Honors**

Dissertation nominated for the **ACM Dissertation Award** 2000  
University of Texas

Selected for the **MCD Fellowship** 1992  
University of Texas

Recipient of the **Forsythe Graduate Fellowship** 1985–1986  
Texas A&M University

**Memberships**

**Phi Kappa Phi** Elected in 1994  
National Honor Scholarship Society

**Pi Mu Epsilon** Elected in 1984  
National Mathematics Honor Society

**Alpha Chi** Elected in 1983  
National Computer Science Honor Society

**ACM**

Association for Computing Machinery, and special interest groups SIGPLAN and SIGWEB

**IEEE/CS**

IEEE Computer Science Society

## Publications

### Book Chapters

- Gamboa, R. “ACL2.” In *The Seventeen Provers of the World*, by F. Wiedijk. Springer, Lecture Notes in Artificial Intelligence, 2006.
- Gamboa, R. “Continuity and Differentiability in ACL2.” In *Computer-Aided Reasoning: ACL2 Case Studies*, by M. Kaufmann, P. Manolios, and J Moore (Eds.) Kluwer Academic Press, 2000.
- Chimenti, D. and R. Gamboa. “Inventory Control.” In *A Logical Language for Data and Knowledge Bases*, by S. Naqvi and S. Tsur. Computer Science Press, 1989.
- Chimenti, D. and R. Gamboa. “Resource Allocation and Deallocation.” In *A Logical Language for Data and Knowledge Bases*, by S. Naqvi and S. Tsur. Computer Science Press, 1989.

### Papers in Refereed Journals

- Gamboa, R. “A Formalization of Powerlist Algebra in ACL2.” To appear in *Journal of Automated Reasoning*.
- Gamboa, R. and J. Cowles. “Theory Extension in ACL2(r).” To appear in *Journal of Automated Reasoning*.
- Gamboa, R. “The Correctness of the Fast Fourier Transform: A Structured Proof in ACL2.” In *Formal Methods in System Design, Special Issue on UNITY*, January, 2002.
- Gamboa, R. and M. Kaufmann. “Non-Standard Analysis in ACL2.” In *Journal of Automated Reasoning*, November, 2001.
- Chimenti, D., R. Gamboa et al. “The LDL System Prototype.” In *IEEE Transactions on Data and Knowledge Engineering*, March, 1990.

### Papers at Refereed Conferences

- Kuzmina, N., J. Paul, R. Gamboa, and J. Caldwell. “Extending Dynamic Constraint Detection with Disjunctive Constraints.” In *6th International Workshop on Dynamic Analysis (WODA)*, Seattle, WA, 2008.
- Paul, J., N. Kuzmina, R. Gamboa, and J. Caldwell. “Toward a Formal Evaluation of Refactorings.” In *Proceedings of the 6th NASA Langley Formal Methods Workshop (LFM 2008)*, Newport News, VA, 2008.
- Kuzmina, N. and R. Gamboa. “Extending Dynamic Constraint Detection with Polymorphic Analysis.” In *5th International Workshop on Dynamic Analysis (WODA)*, Minneapolis, MN, 2007.
- Cowles, J. and R. Gamboa. “Unique Factorization in ACL2: Euclidean Domains.” In *6th International Workshop on the ACL2 Theorem Prover and its Applications*, Seattle, WA, 2006.
- Gamboa, R. and J. Cowles. “Implementing a Cost-Aware Evaluator for ACL2 Expressions.” In *6th International Workshop on the ACL2 Theorem Prover and its Applications*, Seattle, WA, 2006.
- Gamboa, R. and J. Cowles. “A Mechanical Proof of the Cook-Levin Theorem.” In *Proceedings of the 17th International Conference on Theorem Proving and Higher Order Logics (TPHOLS)*, Park City, UT, 2004.
- Yu, B., S.H. Kim, T. Bailey, and R. Gamboa. “Curve-Based Representation of Moving Object Trajectories.” In *Proceedings of the International Database Engineering and Applications Symposium (IDEAS)*, Coimbra, Portugal, 2004.
- Gamboa, R., J. Cowles, and N. Kuzmina. “Axiomatic Events in ACL2(r): A Story of defun, defunstd, and encapsulate.” In *5th International Workshop on the ACL2 Theorem Prover and its Applications*, Austin, TX, 2004.

- Cowles, J. and R. Gamboa. “Contributions to the Theory of Tail Recursive Functions.” In *5th International Workshop on the ACL2 Theorem Prover and its Applications*, Austin, TX, 2004.
- Gamboa, R., J. Cowles, and J. Van Baalen. “On the Verification of Synthesized Kalman Filters.” In *4th International Workshop on the ACL2 Theorem Prover and its Applications*, Boulder, CO, 2003.
- Gamboa, R., J. Cowles, and J. Van Baalen. “Using ACL2 Arrrays to Formalize Matrix Algebra.” In *4th International Workshop on the ACL2 Theorem Prover and its Applications*, Boulder, CO, 2003.
- Gamboa, R. “Writing Literate Proofs with XML Tools.” In *4th International Workshop on the ACL2 Theorem Prover and its Applications*, Boulder, CO, 2003.
- Gamboa, R. and M. Patterson. “Polymorphism in ACL2.” In *4th International Workshop on the ACL2 Theorem Prover and its Applications*, Boulder, CO, 2003.
- Gamboa, R. and B. Middleton. “Taylor’s Formula with Remainder.” In *3rd International Workshop on the ACL2 Theorem Prover and its Applications*, Grenoble, France, 2002.
- Sawada, J. and R. Gamboa. “Mechanical Verification of a Square Root Algorithm using Taylor’s Theorem.” In *Proceedings of the 4th International Conference on Formal Methods in Computer-Aided Design (FMCAD)*, Portland, OR, 2002.
- Gamboa, R. “Mechanically Verifying the Correctness of the Fast Fourier Transform in ACL2.” In the Workshop on Parallel Programming, part of the *1st Merged Symposium of the International Parallel Processing Symposium and the Symposium on Parallel and Distributed Processing (IPPS/SPDP)*, Orlando, FL, 1998.
- Chimenti, D., R. Gamboa, and R. Krishnamurthy. “Abstract Machine for LDL.” In *Proceedings of the 2nd Conference on Extending Database Technology (EDBT)*, Venice, Italy, 1990.
- Chimenti, D., R. Gamboa, and R. Krishnamurthy. “Towards an Open Architecture for LDL.” In *Proceedings of the 15th Conference on Very Large Databases (VLDB)*, Amsterdam, The Netherlands, 1989.

#### Presentations and Other Publications

- Kuzmina, N. and R. Gamboa. “Dynamic Constraint Detection for Polymorphic Behavior.” Poster presented at the *ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA)*, October, 2006.
- Yu, B. and R. Gamboa. “Designing Spatio-Temporal Portals to Continuously Changing Network Nodes.” In *Encyclopedia of Portal Technology and Applications*, 2006.
- Gamboa, R. “Mechanical Verification of Elementary Calculus Theorems in ACL2.” Presented at University of Northern Colorado, September, 2006.
- Gamboa, R., M. Gamboa, and J. Van Baalen. “Building Truly Database-Independent Applications.” Presented at Software Development Conference & Expo, March, 2005.
- Gamboa, R. “Proving Elementary Calculus Theorems in ACL2.” Presented at Texas A&M University, October, 1999.

#### Technical Reports

- Gamboa, R. “Defthms About Zip and Tie: Reasoning About Powerlists in ACL2.” University of Texas Computer Sciences Technical Report TR97-02, 1997.
- Gamboa, R. “Square Roots in ACL2: A Study in Sonata Form.” University of Texas Computer Sciences Technical Report TR96-34, 1996.

Chimenti, D., R. Gamboa, and R. Krishnamurthy. “Using Modules and Externals in LDL.” MCC Technical Report ACA-ST-036-89, 1989.

Chimenti, D. and R. Gamboa. “The SALAD Cookbook: A User’s/Programmer’s Guide.” MCC Technical Report ACA-ST-346-89, 1989.

### Editorial Work

Publications chair and PC member, 8th International Workshop on the ACL2 Theorem Prover and its Applications, 2009.

Reviewer, Free Competition, sponsored by the Netherlands Organisation for Scientific Research (NWO), 2008.

Member, ACL2 Steering Committee, 2006–2010.

NSF Review Panelist, Directorate of Computer and Information Science and Engineering (CISE).

Co-chair, 7th International Workshop on the ACL2 Theorem Prover and its Applications, in Formal Methods in Computer-Aided Design (FMCAD) 2004.

Publications chair and PC member, 6th International Workshop on the ACL2 Theorem Prover and its Applications, in International Joint Conference on Automated Reasoning (IJCAR) 2006.

PC member, 5th International Workshop on the ACL2 Theorem Prover and its Applications, in Formal Methods in Computer-Aided Design (FMCAD) 2004.

PC member, 5th International Workshop on Strategies in Automated Deduction, in International Joint Conference on Automated Reasoning (IJCAR) 2004.

PC member, 3rd International Workshop on the ACL2 Theorem Prover and its Applications, in European Joint Conferences on Theory and Practice of Software (ETAPS) 2002.

PC member, 4th International Workshop on Strategies in Automated Deduction, in International Joint Conference on Automated Reasoning (IJCAR) 2001.

Reviewer, Journal of Automated Reasoning (JAR).

Reviewer, Journal of Automated Reasoning Special Issue on Empirically Successful Automated Reasoning (ESAR-JAR).

Reviewer, IEEE Transactions on Computer-Aided Design (TCAD).

Reviewer, Annals of Mathematics and Artificial Intelligence (AMAI).

Reviewer, Science of Computer Programming (SCP).

Reviewer, Electronic Notes in Theoretical Computer Science (ENTCS).

Reviewer, Journal of Systems and Software (JSS).

Reviewer, Journal of Software and Systems Modeling (SoSyM).

Reviewer, The Computer Journal (COMPJ).

Reviewer, Annual Meeting of the Society for Exact Philosophy (SEP) 2008.

### Grants

Gamboa, R. and J. Caldwell. “REU Supplement for NSF CNS-0613919,” NSF CNS-0752944. \$12,000.

Müller, S. and R. Gamboa. “CSUMS: A Pilot Program to Train Cryptography Students in Computation,” NSF DMS-0639325, 9/13/06–8/31/08, \$196,000.

Gamboa, R. and J. Caldwell. “SoD-HCER: Comprehensibility as a Design Criterion,” NSF CNS-0613919, 9/1/06–8/31/08 (extended to 8/31/09), \$157,428.

- Van Baalen, J. and R. Gamboa. "Video Analysis and Content Exploitation (VACE)," Disruptive Technology Office (DTO), 1/15/07–8/31/10, \$576,000. Terminated 9/1/07 when the DTO decided to make all VACE-related work classified.
- Gamboa, R. "Course Development: Grid Computing for Scientific Applications." Wyoming Space Grant Consortium, 6/1/05–8/31/05, \$5,000.
- Gamboa, R. "Logical Information Machines Next-Generation Time Series." LIM8277, 9/1/03–5/31/06, \$102,957.
- Gamboa, R. MIM software and SUN server, primarily intended for use by the College of Business. 9/1/03–5/31/05, \$65,000.
- Cowles, J., R. Gamboa, and J. Van Baalen. "Mechanical Verification of Synthesized Code." NASA NAG 2-1570, 7/15/02–10/14/03, \$26,387.
- Caldwell, J., R. Gamboa, and J. Van Baalen. "MRI: Acquisition of a Network of Workstations Serving as a Platform for Distributed Automated Reasoning." NSF EIA-0216592, 7/1/02–6/30/05, \$82,530.
- Caldwell, J., R. Gamboa, and J. Van Baalen. "Acquisition of a Network of Workstations Serving as a Platform for Distributed Theorem Proving," partial cost-sharing for EIA-0216592. University of Wyoming, MAJOREQUIP8327, 7/1/02–6/30/05, \$25,000.

## Service

### University Committees

- University Academic Planning Committee, 2008–2011.
- Computer Science Graduate Committee, 2008–2009.
- Computer Science Accreditation Committee, 2008–2009.
- Computer Science APL Search Committee, 2008.
- College of Engineering Tenure and Promotion Committee, 2007–2010.
- Mathematics Faculty Search Committee, 2003–2005.
- Computer Science Faculty Search Committee, 2002–2004.
- Computer Science Equipment Committee, 2003–2004.

### Miscellaneous

- Wyoming FIRST Lego competition judge, 2008.
- Wyoming state science fair judge, 2008.
- Science fair judge at Laramie elementary and middle schools, 2005–2007.
- Affiliate faculty of the Science and Mathematics Teaching Council (SMTC) at UW, 2008–2010.
- Participated in an ad hoc committee exploring a cross-disciplinary minor in computational science at UW, 2007. The resulting undergraduate minor was adopted by UW, starting in the fall of 2009.
- Developed a web application designed to simplify the process of applying for faculty jobs and managing the internal search, 2006–2007. This became the commercial application [www.EZFacultySearch.com](http://www.EZFacultySearch.com).
- Participated in outreach programs related to computers and astronomy at Wyoming K-12 schools, 2006.
- Volunteer instructor of a course on computers and astronomy for 4th and 5th graders, 2005–2006.
- Developed a  $\LaTeX$  stylesheet for writing letters using the department stationery, 2004.
- Developed a graphical gradebook application for the department and others in the university, 2003.

**Personal Information**

Born October 15, 1967, in Colombia, South America. Have lived in South America, Europe, and the United States. U.S. Citizen. Married, with two kids (12 and 8).

Amateur astronomer, science fiction fan, space enthusiast, private pilot.