

Curriculum Vitae

LUIS DAVID GARCIA-PUENTE

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Date of Birth: 25 July 1976
Birthplace: Mexico City, Mexico
Citizenship: Mexican (U.S. permanent resident)
Race: Hispanic
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Education:

- Ph.D. 2004 Virginia Polytechnic Institute and State University, Mathematics
Advisor: Reinhard Laubenbacher
Dissertation: Algebraic Geometry of Bayesian Networks
- B.S. 1999 National University, Mexico, Mathematics
Honors thesis in Gröbner bases
Minor in Computer Science

Employment:

- 2007 – Assistant Professor
Sam Houston State University, Huntsville, TX
- 2005 – 2007 Visiting Assistant Professor
Texas A&M University, College Station, TX
- Fall 2004 Postdoctoral Research Fellow
Mathematical Science Research Institute, Berkeley, CA
- Sum. 2004 Postdoctoral Research Fellow
Department of Mathematics, University of California, Berkeley, CA
- Spr. '03; '04 Graduate Research Assistant
Virginia Bioinformatics Institute, Virginia Tech, Blacksburg, VA
- Sum. 2000 Graduate Research Fellow
Physical Science Laboratory, New Mexico State University, Las Cruces, NM

Research Interests:

Algebraic Statistics, Computational Algebraic Geometry, Combinatorial Commutative Algebra

Awards and Fellowships:

- Spring 2009 SAMSI New Researcher fellowship, Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC.
- Fall 2004 Postdoctoral Fellow, Mathematical Science Research Institute, Berkeley, CA.
- Fall 2002 Research Fellow, University of Genova, Italy.
- 1999 Sotero Prieto Award for the Best Undergraduate Thesis of the Year.
Nationwide honor awarded by the Mexican Mathematical Society.

Grants:

- 2008 - 2010 Norman Hackerman Advanced Research Program (ARP) 2007 grant no. 010366-0054-2007. Project title “Applications of Algebraic Geometry to Algebraic Statistics and Geometric Modeling” in collaboration with F. Sottile. Awarded amount \$144,000.
- Feb. 2006 Internal Texas A&M University Grant in support of the proposal “Mathematical Foundations for Probabilistic Boolean Networks” submitted to the Career Awards at the Scientific Interface program of the Burroughs Wellcome Fund.

Publications:

1. Parameter inference of Gaussian graphical models (with S. Spielvogel and S. Sullivant), in preparation.
2. Gröbner bases and partial sums of catalan numbers (with C. Hillar and K. Talaska), in preparation.
3. Experimentation at the Frontiers of reality in Schubert calculus (with C. Hillar, A. Martin Del Campo, J. Ruffo, Z. Teitler, S. Johnson and F. Sottile), accepted in *Contemporary Mathematics*.
4. Parameter estimation for Boolean models of biological networks (with E. Dimitrova, F. Hinkelmann, A. S. Jarrah, R. Laubenbacher, B. Stigler, M. Stillman and P. Vera-Licona), accepted in *Special Issue on Foundations of Formal Reconstruction of Biochemical Networks. Journal of Theoretical Computer Science*.
5. Some geometrical aspects of control points for toric patches (with G. Craciun and F. Sottile), accepted in *Mathematical Methods for Curves and Surfaces. Proceedings of the Seventh International Conference on Mathematical Methods for Curves and Surfaces, Tønsberg, Norway, June 26 - July 1, 2008. Lecture Notes in Computer Science. Springer*.
6. An optimization algorithm for the inference of biological networks (with M. P. Vera-Licona, A. S. Jarrah, J. McGee, and R. Laubenbacher), submitted.
7. Linear precision for parametric patches (with F. Sottile), accepted in *Advances in Computational Mathematics*.
8. Computing the additive structure of indecomposable modules over Dedekind-like rings using Gröbner bases (with M. A. Aviño-Díaz), in *Journal of Algebra and Its Applications*, **6/2** (2007) pp. 291-304.
9. Catalog of small trees (with M. Casanellas and S. Sullivant), book chapter in *Algebraic Statistics for Computational Biology*, (L. Pachter and B. Sturmfels Eds.) Cambridge University Press, (2005) pp. 291–304.
10. Sequential dynamical systems over words (with A.S. Jarrah and R. Laubenbacher), in *Applied Mathematics and Computation*, **174/1** (2005) pp. 500-510.

11. Algebraic geometry of Bayesian networks (with M. Stillman and B. Sturmfels), in *Journal of Symbolic Computation*, **39/3–4** (2005) pp. 331–355. Special issue on the occasion of Mega 2003.
12. Algebraic Statistics in model selection, in M. Chickering and J. Halpern, editors, *Proceedings of the 20th Conference of Uncertainty in Artificial Intelligence*, (2004) 177–184.
13. Bases de Gröbner asociadas a módulos finitos, in *Miscelánea Matemática (MMS)* **30** (2000), pp. 65–70.

Conference Talks:

- 2009 June 15th International Conference on Applications of Computer Algebra (Montréal, Québec, Canada): Experimentation at the Frontiers of reality in Schubert calculus.
- 2008-09 Program on Algebraic Methods in Systems Biology and Statistics Transition Workshop, Statistical and Applied Mathematical Sciences Institute (Research Triangle Park, NC): Toric statistical models, toric patches and toric dynamical systems: Applications of toric varieties in the sciences.
- Apr. Second International Workshop on Algebraic Geometry and Approximation Theory (Towson University, Towson, MD): Geometric properties of toric patches.
- AMS Special Session on Mathematics of Biochemical Reaction Networks. 2009 Spring AMS Southeastern Section Meeting (Raleigh, NC): Injectivity of toric patches.
- Feb. SAMSI Two-Day Undergraduate Workshop. 2008-09 SAMSI Education and Outreach Program, Statistical and Applied Mathematical Sciences Institute (Research Triangle Park, NC): Introductory lecture on algebraic statistical models.
- Jan. Special Session on Computational Algebra and Convexity. 2009 Joint Mathematics Meetings (Washington, D.C.): Geometrical aspects of control points for toric patches.
- Algebraic Statistical Models Workshop. 2008-09 Program on Algebraic Methods in Systems Biology and Statistics, Statistical and Applied Mathematical Sciences Institute (Research Triangle Park, NC): Algebraic methods for phylogenetic inference (poster).
- 2008 Dec. 2008 Combinatorial and Computational Aspects of Optimization, Topology and Algebra (ACCOTA) Conference (Oaxaca City, Oaxaca, Mexico): Algebra, geometry, and combinatorics of sandpiles (poster).
- 2008 Combinatorial and Computational Aspects of Optimization, Topology and Algebra (ACCOTA) Conference (Oaxaca City, Oaxaca, Mexico): Sandpile models.
- Sept. Fourth Annual Texas Undergraduate Mathematics Conference (Sam Houston State University, Huntsville, TX): How to draw complex functions.

- SAMSU Workshop on Algebraic Methods in Systems Biology and Statistics (Statistical and Applied Mathematical Sciences Institute, Research Triangle Park, NC): Linear precision for toric patches is maximum likelihood estimation for toric models (poster).
- July MSRI Workshop on Geometry and Representation Theory (Mathematical Sciences Research Institute, Berkeley, CA): Phylogenetic algebraic geometry.
- Apr. First International Workshop on Algebraic Geometry and Approximation Theory (Towson University, Towson, MD): Linear precision for toric patches.
- First International Workshop on Algebraic Geometry and Approximation Theory (Towson University, Towson, MD): What is computational algebraic geometry?
- Mar. Special session on Toric Varieties. 32nd SIAM Southeastern-Atlantic Section Conference (University of Central Florida, Orlando, FL): Linear precision for toric patches.
- 2007 Oct. Second Workshop on Constructive Function Theory (Sam Houston State University, Huntsville, TX): Linear precision for toric patches.
- July Applicable Algebraic Geometry (2007 IMA PI Summer Program for Graduate Students, Texas A&M University, College Station, TX): Bézier curves and surfaces.
- May Workshop on Non-Linear Computational Geometry (Institute for Mathematics and its Applications, MN): Linear precision for parametric patches (poster).
- Jan. AMS Special Session on Computational Algebraic and Analytic Geometry for Low-Dimensional Varieties. 2007 Joint Mathematics Meetings (New Orleans, LA): Linear precision for parametric patches.
- 2004 May Special Session on Algebraic Geometry. 2004 Joint AMS-SMM International Meeting (Houston, TX): Algebraic geometry applications in Bayesian model selection.
- Apr. MSRI workshop on Algorithmic, Combinatorial and Applicable Real Algebraic Geometry (Berkeley, CA): Algebraic geometry applications in model selection.
- 2003 Dec. Computational Algebraic Statistics (American Institute of Mathematics, Palo Alto, CA): Independence varieties of Bayesian networks on three observable variables and one hidden variable.
- June Challenges in Stochastic Computation Closing Workshop (SAMSU, NC): Algebraic geometry of Bayesian networks with hidden variables.
- 2003 Effective Methods in Algebraic Geometry (MEGA) Conference (Kaiserslautern, Germany): Algebraic geometry of Bayesian networks.
- Feb. Grostat VI Conference and International School on Algebraic Statistics (Universite De Nice-Sophia Antipolis, Menton, France): Algebraic classification of Bayesian networks.
- 2002 Aug. Special Session on Systems. 2002 SIAM Discrete Mathematics Conference (San Diego, CA): Classification of finite dynamical systems.

- 2001 Sept. Graduate Oral Presentations in Mathematics. SACNAS National Conference (Phoenix, AZ): Mathematical foundations for computer simulations.
- 2000 Oct. Graduate Oral Presentations in Mathematics. SACNAS National Conference (Atlanta, GA): Combinatorial tools for the analysis of decision systems.
- 1999 June Summer Conference on Computational Algebra with Applications (U. Wyoming, WY): Computing Gröbner bases associated to finite modules.
- Feb. Conference on Gröbner bases CIMAT-MSRI (Guanajuato, México): Gröbner bases associated to finite modules.

Colloquia and Seminar Talks:

- 2009 Nov. Southern Methodist University Research Colloquium
- Apr. Coloquio del Instituto de Matemáticas, Universidad Nacional Autónoma de México (Mexico City, México)
- Cinvestav Mathematics Colloquium (Mexico City, México)
- Mar. North Carolina State University Symbolic Computation Seminar
- Clemson University Algebra and Discrete Mathematics Seminar
- Feb. Algebraic Statistics and Experimental Design Working Group Seminar, SAMSI Program on Algebraic Methods in Systems Biology and Statistics
- Reed College Colloquium
- 2008 Nov. Sam Houston State University Colloquium
- 2007 Aug. Sam Houston State University Colloquium
- Mar. Texas A&M University Algebra and Combinatorics Seminar
- Jan. North Carolina State University Colloquium
- Sam Houston State University Colloquium
- 2006 Nov. Sam Houston State University Colloquium
- May. Texas A&M University Algebra and Combinatorics Seminar
- 2005 Oct. Texas A&M University Postdoc Seminar
- Mar. UC Berkeley Algebraic Statistics for Computational Biology Seminar
- 2004 Dec. MSRI Postdoc Seminar
- Nov. Texas A&M University Algebraic Geometry Seminar
- Oct. Sam Houston State University Colloquium
- Apr. University of Washington Algebra Seminar
- 2003 Aug. Georgia Tech Informal Geometry Seminar
- May. National University Seminario de Algebra (Morelia, Mexico)
- Jan. UC Berkeley Workshop on Algebraic Statistics
- 2002 Dec. University of Cantabria (Santander, Spain)

- Nov. Politecnico di Torino Algebraic Statistics Seminar (Torino, Italy)
 Aug. MSRI Combinatorial Commutative Algebra Seminar
 Mar. Virginia Tech SIAM Graduate Student Seminar
 2001 Oct. University of Bordeaux I (Bordeaux, France)

Teaching Activities:

- 2010 Spr. Sam Houston State University, Instructor, MTH 142 Calculus I, MTH 199 Business Mathematics, MTH 636 Abstract Algebra II
- 2009 Fall Sam Houston State University, Instructor, MTH 142 Calculus I and MTH 677 Abstract Algebra
 Sum. Sam Houston State University, Instructor, MTH 164 College Mathematics, and MTH 199 Mathematics for Managerial Decision Making
- 2008 Fall Sam Houston State University, Instructor, MTH 142 Calculus I, MTH 163 Plane Trigonometry, and MTH 470W/560 Special Topics (Algorithms for Elementary Algebraic Geometry)
 Sum. Sam Houston State University, Instructor, MTH 032 Developmental Mathematics II and MTH 163 Plane Trigonometry
 Spr. Sam Houston State University, Instructor, MTH 164 College Mathematics and MTH 142 Calculus I
- 2007 Fall Sam Houston State University, Instructor, MTH 164 College Mathematics and MTH 376 Differential Equations
 Sum. Texas A&M University, Assistant Instructor, 2007 IMA PI Summer Program for Graduate Students on Applicable Algebraic Geometry
 — Undergraduate Research in Mathematics at Texas A&M University program, Guest Speaker, Math 662–100, REU/VIGRE course on Algebraic Methods in Bioinformatics
 Spr. Texas A&M University, Instructor, Math 689 Applicable Algebraic Geometry (with F. Sottile)
- 2006 Fall Texas A&M University, Instructor, Math 251 Calculus III
 Sum. Undergraduate Research in Mathematics at Texas A&M University program, Instructor, Math 662 REU/VIGRE course on Algebraic Methods in Computational Biology (with M. Rojas)
 Spr. Texas A&M University, Instructor, Math 308 Differential Equations
- 2005 Fall Texas A&M University, Instructor, Math 142 Business Calculus II
 Sum. Undergraduate Research in Mathematics at Texas A&M University program, Instructor, Math 662 REU/VIGRE course on Algebraic Methods in Computational Biology (with M. Rojas and L. Fukshansky)
 Spr. Texas A&M, Instructor, Math 152 Calculus II
- 2003 Fall Virginia Tech, Graduate Teaching Assistant, Math 1205 Calculus I

- 2002 Spr. Virginia Tech, Graduate Teaching Assistant, Math 1205 Calculus I
- 2001 Sum. Summer Institute in Mathematics for Undergraduates, NSF/REU program, University of Puerto Rico–Humacao, Teaching Assistant, computational algebra course (with R. Laubenbacher and R. Garcia)
- 1999 – 2000 New Mexico State University, Graduate Teaching Assistant, Intermediate algebra, Precalculus, and Trigonometry
- 1997 – 1998 National University of Mexico, Undergraduate Teaching Assistant, C⁺⁺ Programming language, Data Structures, College Algebra, and Linear Algebra

Departmental and University Committee Service:

- Member of the Hiring Committee, Sam Houston State University, 2009-2010.
- Library liaison for the Department of Mathematics and Statistics, Sam Houston State University. Since Fall 2008.
- Member of the MTH 163 – Trigonometry Textbook Committee, Sam Houston State. Spring 2008.
- Member of the MS in Mathematics Revision Committee, Sam Houston State. 2007-2009
- Member of the Engineering-Technology Committee for the College of Arts and Sciences, Sam Houston State. 2007-2008.

Other Departmental Activities:

- 2007 Spr. Organizer (with F. Sottile) of the Algebra and Combinatorics Seminar, Texas A&M.
- 2006 Fall Organizer (with F. Sottile) of the Algebra and Combinatorics Seminar, Texas A&M.
- 2003 Fall Organizer (with R. Laubenbacher) of the seminar on Algebraic Statistics, Virginia Tech.
- 2002 Fall Organizer (with L. Robbiano) of the seminar on Algebraic Geometry of Graphical Models, University of Genova, Italy.
- 2002 Spr. Founder of the Graduate Student Seminar sponsored by the SIAM University Chapter at Virginia Tech.
- 2001 Spr. Organizer (with R. Laubenbacher) of the seminar on Gröbner Bases and Convex Polytopes, New Mexico State University.

Conference Organization:

- 2010 Jan. Organizer (with F. Sottile) of the special session on Applications of Algebraic Geometry, 2010 Joint Mathematics Meetings in San Francisco, CA.
- 2009 Oct. Organizer (with F. Sottile) of the special session on Applicable Algebraic Geometry, 2009 Fall Central Section Meeting of the AMS in Waco, TX.

- Apr. Organizer (with T. Sorokina) of the Second International Workshop on Algebraic Geometry and Approximation Theory, Towson University.
- 2008 Apr. Organizer (with T. Sorokina) of the First International Workshop on Algebraic Geometry and Approximation Theory, Towson University.

Advising:

- 2009 Supervised SHSU undergraduate students Alexander Diaz, Andrew Howard, Sarah Spielvogel and graduate student Jessica Ellis. Research supported through the 2007 Norman Hackerman Advanced Research Program grant no. 010366-0054-2007.
- 2008 Fall Supervised SHSU undergraduate students: Alexander Diaz, Andrew Howard and Sarah Spielvogel. Research supported through the 2007 Norman Hackerman Advanced Research Program grant no. 010366-0054-2007.
- 2008 Sum. Supervised SHSU undergraduate students: Alexander Diaz and Andrew Howard. Research supported through the 2007 Norman Hackerman Advanced Research Program grant no. 010366-0054-2007.
- 2006 Sum. (with M. Rojas) REU/VIGRE Summer students: Hannah Saugier and Stacey Stokes.
- 2005 Sum. (with M. Rojas) REU/VIGRE Summer students: Elizabeth Dong, Guangming Lang, and Jacob Porter.

Professional Associations:

American Mathematical Society, Society for Industrial and Applied Mathematics, Society for Advancement of Chicanos and Native Americans in Science, Sociedad Matemática Mexicana.

Major Journals Refereed:

IEEE Computational Biology, Journal of Algebra, Journal of Symbolic Computation, SIAM Journal of Discrete Mathematics, Journal of Commutative Algebra

Other Referee Activities:

Reviewer for Mathematical Reviews since 2007.

Reviewer for Zentralblatt MATH since 2007.

Reviewer for the issue on Nonlinear Computational Geometry of the IMA Volumes in Mathematics and its Applications published by Springer-Verlag.

Reviewer for the Algebraic Biology 2007 Conference Proceedings.

Reviewer for the conference MEGA 2009 (Effective Methods in Algebraic Geometry).

Programming Skills:

Computer Algebra Systems:	CoCoA	Macaulay2	Maple	Mathematica	Sage	Singular
Numerical Systems:	Matlab					
Programming Languages:	C	C++	Perl	Python		
Web Development:	MySQL	PHP	HTML	CSS		
Operating Systems:	Linux	OS X				

Software:

- Collaborator in the *Polynome: Discrete System Identification* project. Polynome is a web-based software for the reconstruction and parameter estimation of algebraic models in systems biology. <http://polymath.vbi.vt.edu/polynome/> .
- Collaborator in the *Frontiers of reality in Schubert calculus* project. We develop software to execute a large-scale computation to study questions in the Schubert calculus, with a focus on generalizations of the Shapiro conjecture. <http://www.math.tamu.edu/~secant/> .
- Designer and principal developer of the Small Phylogenetic Trees website: <http://www.shsu.edu/~ldg005/small-trees/>. This website contains algebraic information of small phylogenetic trees under several models of biological evolution. Maple package to perform all computations is included (with J. Porter).
- Singular library to compute all complex solutions to the critical equations of the maximum likelihood function of a statistical model. Singular is a computer algebra system developed at the University of Kaiserslautern.
- Optimization algorithm for the identification of biochemical network models (with R. Laubenbacher, J. McGee, and P. Vera-Licona).
- Macaulay2 and Singular libraries to compute the independence varieties and primary decomposition of Bayesian networks (with M Stillman). Macaulay2 is a computer algebra system developed by Michael Stillman and Daniel Grayson.
- CoCoA library to compute the primary decomposition of zero dimensional ideals. Implementation for the general case in progress. CoCoA is a computer algebra system developed at the University of Genova, Italy.
- Tulip modules for the biocomplexity research program at NMSU. Tulip is a graph visualization software developed at the University of Bordeaux I.
- C++ program to compute combinatorial homotopy of simplicial complexes (with R. Laubenbacher).

References:

Mark Klespis, Sam Houston State University, klespis@shsu.edu, (936) 294-1577

Reinhard Laubenbacher, Virginia Bioinformatics Institute, reinhard@vbi.vt.edu, (540) 231-7506

Frank Sottile, Texas A&M University, sottile@math.tamu.edu, (979) 845-4169

Bernd Sturmfels, University of California, Berkeley, bernd@math.berkeley.edu, (510) 642-4687