Seth Sullivant

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Education

Ph.D. 2005, Mathematics, University of California, Berkeley. Advisor: Bernd Sturmfels
M.A. 2002, Mathematics, San Francisco State University, CA. Advisor: Serkan Hoşten
B.A. 2000, Mathematics, University of California, Berkeley

Employment

2005-2008 Harvard University– Junior Fellow, Harvard Society of Fellows
2007 University of Minnesota– Visitor at the Institute for Mathematics and Its Applications, Feb. - Mar, 2007.

Research Interests

Algebraic statistics; multivariate statistics; log-linear and graphical models; applications to phylogenetics and disclosure limitation; commutative, combinatorial, and computational algebra; algebraic geometry; algebraic and enumerative combinatorics; polyhedral geometry; optimization.

Publications

Theses:

2005 Toric ideals in algebraic statistics. Ph. D. thesis, University of California, Berkeley.
2002 Algebraic geometry and combinatorics of hierarchical models. M. A. thesis, San Francisco State University.

Submitted for Publication:

2007 (with N. Beerenwinkel) Markov models for accumulating mutations.
Conditional independence for Gaussian random variables has no finite complete characterization.
(with S. Hoşten) Algebraic complexity of maximum likelihood estimation in bivariate missing data problems.

In Press:

2007 Algebraic geometry of Gaussian Bayesian networks. To appear in *Advances in Applied Mathematics*.
2006 (with J. Sidman) Prolongations and computational algebra. To appear in *Canadian Journal of Mathematics*.
(with M. Drton) Algebraic statistical models. To appear in *Statistica Sinica*.
Combinatorial symbolic powers. To appear in *Journal of Algebra*.
(with B. Sturmfels) Toric geometry of cuts and splits. To appear in *Michigan Mathematical Journal*.
Toric fiber products. To appear in *Journal of Algebra*.

In Print:

2007 16. (with S. Hoşten) A finiteness theorem for Markov bases of hierarchical models. *J. Combin. Theory Ser. A* **114** (2007), no. 2, 311–321.

15. (with M. Drton and B. Sturmfels) Algebraic factor analysis: tetrads, pentads, and beyond. *Probab. Theory Related Fields* **138** (2007), no. 3-4, 463–493.

2006 14. Compressed polytopes and statistical disclosure limitation. *Tohoku Mathematical Journal* **58** (2006), 433-445.

13. (with B. Sturmfels) Combinatorial secant varieties. *Quarterly Journal of Pure and Applied Mathematics* **2** (2006) 285–309.

12. (with Y. Chen and I. Dinwoodie) Sequential importance sampling for multiway tables. *Annals of Statistics.* **34** (2006) No. 1, 523-545

11. (with N. Eriksson, S. E. Fienberg, and A. Rinaldo) Polyhedral conditions for the nonexistence of the MLE for hierarchical log-linear models. *Journal of Symbolic Computation*: special issue on Computational Algebraic Statistics, **41** (2006), 222–233.

10. (with A. Slavkovic) The space of compatible full conditionals is a unimodular toric variety. *Journal of Symbolic Computation*: special issue on Computational Algebraic Statistics, **41** (2006), 196–209.

2005 9. (with N. Eriksson, K. Ranestad, and B. Sturmfels) Phylogenetic algebraic geometry. In *Projective Varieties with Unexpected Properties*, edited by C. Ciliberto, et al., Walter de Gruyter, Berlin, 2005.

8. (with M. Casanellas) The strand symmetric model. Chapter in *Algebraic Statistics for Computational Biology*, (eds. L. Pachter and B. Sturmfels) 2005.

7. (with M. Casanellas and L. Garcia) Catalog of small trees. Chapter in *Algebraic Statistics for Computational Biology* (eds. L. Pachter and B. Sturmfels), 2005.

6. Small contingency tables with large gaps. *SIAM Journal on Discrete Mathematics.* **18** (2005), no. 4, 787-793.

5. (with B. Sturmfels) Toric ideals of phylogenetic invariants. *Journal of Computational Biology*, **12** no. 2 (2005), 204-228.

2004 4. (with A. Dobra) A divide-and-conquer algorithm for generating Markov bases of multi-way tables. *Computational Statistics* **19** (2004), 347-366.

3. (with S. Hoşten) Ideals of adjacent minors. *Journal of Algebra* **277** (2004), 615-642.

2003 2. (with M. Develin) Markov bases of binary graph models. *Annals of Combinatorics*, **7** (2003), 441-466.

2002 1. (with S. Hoşten) Gröbner bases and polyhedral geometry of reducible and cyclic models. *Journal of Combinatorial Theory: Series A* **100** (2002) no. 2, 277-301.

Honors and Awards

2007 -2010 NSF grant DMS-0700078 *Algebraic Statistical Models* $ 106,457

2005 Junior Fellow, Harvard Society of Fellows, 2005 - 2008.

Bernard Friedman Prize, UC Berkeley, top thesis in applied mathematics.

2004 Charles B. Morrey, Jr. Prize, UC Berkeley, for outstanding graduate student research in mathematics.

2002 Departmental Honor, SFSU, given to top graduating Masters' student.

2001 NSF Graduate Research Fellowship 2001- 2005.

Short Courses Taught

2007 Applicable Algebraic Geometry. IMA Summer School at Texas A&M.

Minicourse on Algebraic Statistics. Technische Universiteit Eindhoven.

2006 Winter School on Algebraic Statistics. Universidad de Buenos Aires.

Summer School on Algebraic Statistics, Tropical Geometry, and Computational Biology. Sophus Lie Conference Center, Nordfjordeid, Norway.

Invited Conference Talks

2008 Special Session on Secant Varieties and Related Topics, *Joint Mathematics Meeting*, San Diego, CA.

2007 Special Session on Combinatorial Enumeration, Optimization, Geometry and Statistics *AMS Southeastern Sectional*, Murfreesboro, TN.

Multivariate Interpolation– Its Relation to Algebraic Statistics, Classical Algebraic Geometry, and Computational Complexity Theory, Sestri Levante, Italy.

Commutative Algebra and Its Interaction with Algebraic Geometry, *BIRS*, Banff.

International Conference on Theoretical and Practical Effectivity of Gröbner Bases, *RIMS*, Kyoto, Japan.

2006 New England Discrete Math Day, College of the Holy Cross, MA.

Computational and Combinatorial Commutative Algebra, *Fields Institute*, Toronto.

Special Session on Graphical and Algebraic Statistical Models, *European Meeting of Statisticians*, Torun, Poland.

2004 Special Session on Geometry and Combinatorics, *Joint Math Meeting*, Phoenix, AZ.

2003 Computational Algebraic Statistics, *American Institute of Math*, Palo Alto, CA.

Commutative Algebra: Presentations by Young Researchers, *AMS-IMS-SIAM Summer Research Conference*, Snowbird, UT.

Lattice Points in Polyhedra, *AMS-IMS-SIAM Summer Research Conf.*, Snowbird, UT.

Workshop on Stochastic Computation, *SAMSI*, Research Triangle Park, NC.

Special Session on Combinatorial Commutative Algebra and Algebraic Geometry, *AMS Western Section Meeting*, San Francisco, CA.

2002 Combinatorics and Integer Programming of Multidimensional Tables, *INFORMS*, San Jose, CA.

Symbolic Computational Algebra 2002, *ORCCA*, University of Western Ontario, London, Ontario, Canada.

Multidimensional Tables: Statistics, Optimization and Gröbner bases, Davis, CA.

Colloquia and Seminars

2007 Massachusetts Institute of Technology, Harvard U., U. Chicago, U. Warwick, U. Minnesota, IMA, Colorado State U.

2006 Harvard U., U. Pennsylvania, San Francisco State U., U. California–Berkeley, Massachusetts Institute of Technology

2005 Harvard U., Queen's U., Duke U., U. Chicago, U. Massachusetts–Amherst, San Francisco State U., U. Barcelona

2004 U. Massachusetts–Amherst, Pennsylvania State U., Carnegie Mellon U., U. California–Berkeley, Duke U., North Carolina State U., Harvard U.

2003 U. California–Berkeley, U. Washington, Stanford U., MSRI

2002 MSRI, U. California–Berkeley

Professional Activities

Co-editor (with M. Putinar) IMA Volume on *Emerging Applications of Algebraic Geometry*

Guest Associate Editor for the Statistica Sinica Theme Topic on *Algebraic Statistics and Computational Biology*

Referee: Advances in Applied Mathematics, Advances in Geometry, Algorithms for Molecular Biology, Annals of Combinatorics, Australian and New Zealand Journal of Statistics, Experimental Mathematics, IEEE/ACM Transactions on Computational Biology and Bioinformatics, Journal of Algebra, Journal of Combinatorial Theory: Series A, Journal of the European Mathematical Society, Journal of Multivariate Analysis, Journal of Pure and Applied Algebra, Journal of Statistical Planning and Inference, Journal of Symbolic Computation, Proceedings of the AMS.

Member: AMS, IMS

Conference and Workshop Organization

2008 Algebraic Biology, RISC, Linz, Austria, July 31 - August 2.

2007 Applications in Biology, Dynamics, and Statistics, Institute for Mathematics and Its Applications, March 5-9.

2006 Algebraic Statistics: Theory and Practice. AMS Special Session, Joint Mathematics Meeting, San Antonio, TX, January 12-13.

2005 Algebraic Statistics and Computational Biology. Clay Mathematics Institute, Cambridge, MA, November 12-14.

Teaching Experience

2004 UC Berkeley, Graduate Student Instructor, Math 1B (Calculus)

2001 San Francisco State University, Graduate Student Lecturer, Math 109 (Pre-Calculus)

2000 San Francisco State University, Graduate Student Lecturer, Math 59 (Algebra)

1999 UC Berkeley, Undergraduate Student Instructor, Math1B (Calculus)

References

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San Francisco State University
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(206) 685-8488

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