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ACCEPTED POSITIONS

Assistant Professor, North Carolina State University, Raleigh, NC. Starting August 2012.

POSITIONS HELD

Postdoctoral Fellowship, Institut Mittag–Leffler, Djursholm, Sweden, January 2011 – June 2011.
Scientific Program on Algebraic Geometry with a view towards applications

Visiting Assistant Professor, Texas A&M University, College Station, TX, January 2010 – August 2012.
On leave January 2011 – June 2011.
Mentor: Frank Sottile

Fields Postdoctoral Fellow, Fields Institute, Toronto, Ontario, Canada, July 2009 – December 2009.
Thematic Program on the Foundations of Computational Mathematics

Visiting Scholar, University of Notre Dame, Notre Dame, IN, July 2009 – current.
Department of Applied and Computational Mathematics and Statistics

Postdoctoral Research Associate, University of Notre Dame, Notre Dame, IN, May 2009 – June 2009.

EDUCATION

Ph.D. in Mathematics, University of Notre Dame, Notre Dame, IN, May 2009.

Thesis adviser: Andrew J. Sommese

Thesis title: *Regeneration, local dimension, and applications in numerical algebraic geometry*

M.S. in Mathematics, Miami University, Oxford, OH, August 2005.

B.S. *summa cum laude* in Mathematics and Math–Pre–Engineering Emphasis (Computer Science minor),
University of Findlay, Findlay, OH, May 2003.

RESEARCH GRANTS

NSF DMS 1114336: *Computational Methods in Numerical Algebraic Geometry*, 2011 – 2014, \$94,000.

PUBLICATIONS

BOOKS

- (1) D.J. Bates, J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. *Numerically Solving Polynomial Systems with the Software Package Bertini*. In preparation. To be published by SIAM, 2013.

PUBLISHED ARTICLES

- (2) D.J. Bates, J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. Adaptive multiprecision path tracking. *SIAM J. Numer. Anal.*, 46(2), 722–746, 2008.
- (3) D.J. Bates, J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. Software for numerical algebraic geometry: a paradigm and progress towards its implementation. *Software for Algebraic Geometry*, edited by M.E. Stillman, N. Takayama, and J. Verschelde, Volume 148 of *IMA Volume in Mathematics and its Applications*, Springer Verlag, 2008, pp. 1–14.
- (4) A.N. Al-Khateeb, J.M. Powers, S. Paolucci, A.J. Sommese, J.A. Diller, J.D. Hauenstein, and J.D. Mengers. One-dimensional slow invariant manifolds for spatially homogeneous reactive systems. *J. Chem. Phys.*, 131(2), 024118, 2009.
- (5) D.J. Bates, J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. Stepsize control for adaptive multiprecision path tracking. *Contemp. Math.*, 496, 21–31, 2009.

- (6) J.D. Hauenstein, J.C. Migliore, C. Peterson, and A.J. Sommese. Numerical computation of the dimensions of the cohomology of twists of ideal sheaves. *Contemp. Math.*, 496, 235–242, 2009.
- (7) D.J. Bates, J.D. Hauenstein, C. Peterson, and A.J. Sommese. A numerical local dimension test for points on the solution set of a system of polynomial equations. *SIAM J. Numer. Anal.*, 47(5), 3608–3623, 2009.
- (8) D.J. Bates, J.D. Hauenstein, C. Peterson, and A.J. Sommese. Numerical decomposition of the rank-deficiency set of a matrix of multivariate polynomials. *Approximate Commutative Algebra*, edited by L. Robbiano and J. Abbott, *Texts and Monographs in Symbolic Computation*, Springer Verlag, 2010, pp. 55–77.
- (9) J.D. Hauenstein. A counter example to an ideal membership. *Adv. Geom.*, 10(3), 557–559, 2010.
- (10) J.D. Hauenstein and A.J. Sommese. Witness sets of projections. *Appl. Math. Comput.*, 217(7), 3349–3354, 2010.
- (11) J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. Regeneration homotopies for solving systems of polynomials. *Math. Comp.*, 80, 345–377, 2011.
- (12) W. Hao, J.D. Hauenstein, B. Hu, Y. Liu, A.J. Sommese, and Y.-T. Zhang. Multiple stable steady states of a reaction-diffusion model on zebrafish dorsal-ventral patterning. *Discrete Cont. Dyn. S.*, 4(6), 1413–1428, 2011.
- (13) C.W. Wampler, J.D. Hauenstein, and A.J. Sommese. Mechanism mobility and a local dimension test. *Mech. Mach. Theory*, 46(9), 1193–1206, 2011.
- (14) J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. Regenerative cascade homotopies for solving polynomial systems. *Appl. Math. Comput.*, 218(4), 1240–1246, 2011.
- (15) W. Hao, J.D. Hauenstein, B. Hu, and A.J. Sommese. A three-dimensional steady-state tumor system. *Appl. Math. Comp.*, 218(6), 2661–2669, 2011.
- (16) D.J. Bates, J.D. Hauenstein, and A.J. Sommese. A parallel endgame. *Contemp. Math.*, 556, 25–35, 2011.
- (17) D.J. Bates, J.D. Hauenstein, and A.J. Sommese. Efficient path tracking methods. *Numer. Algorithms*, 58(4), 451–459, 2011.
- (18) W. Hao, J.D. Hauenstein, B. Hu, Y. Liu, A.J. Sommese, and Y.-T. Zhang. Bifurcation for a free boundary problem modeling the growth of a tumor with a necrotic core. *Nonlinear Anal. – Real World Appl.*, 13(2), 694–709, 2012.
- (19) H. Tari, H.-J. Su, and J.D. Hauenstein. Classification and complete solution of the kinetostatics of a compliant Stewart-Gough platform. *Mech. Mach. Theory*, 49, 177–186, 2012.
- (20) J.D. Hauenstein and F. Sottile. Algorithm 921: alphaCertified: Certifying solutions to polynomial systems. *ACM Trans. Math. Softw.*, 38(4), 2012.
- (21) W. Hao, J.D. Hauenstein, B. Hu, Y. Liu, A.J. Sommese, and Y.-T. Zhang. Continuation along bifurcation branches for a tumor model with a necrotic core. *J. Sci. Comput.*, DOI:10.1007/s10915-012-9575-x, 2012.

ACCEPTED ARTICLES

- (22) G. Blekherman, J.D. Hauenstein, J.C. Ottem, K. Ranestad, and B. Sturmfels. Algebraic boundaries of Hilbert’s SOS cones. To appear in *Compositio Mathematica*.

SUBMITTED ARTICLES

- (23) W. Hao, J.D. Hauenstein, B. Hu, and A.J. Sommese. A domain decomposition algorithm for computing multiple steady states of differential equations. Submitted 2011.
- (24) J.D. Hauenstein. Algebraic computations using Macaulay dual spaces. Submitted 2011.
- (25) J.D. Hauenstein. Numerically computing real points on algebraic sets. Submitted 2011.
- (26) J.D. Hauenstein and C.W. Wampler. Isosingular sets and deflation. Submitted 2011.

- (27)G.M. Besana, S. Di Rocco, J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. Cell decomposition of almost smooth real algebraic surfaces. Submitted 2011.
- (28)Z.A. Griffin, J.D. Hauenstein, C. Peterson, and A.J. Sommese. Numerical computation of the Hilbert function of a zero-scheme. Submitted 2011.
- (29)D.J. Bates, J.D. Hauenstein, T.M. McCoy, C. Peterson, and A.J. Sommese. Recovering exact results from inexact numerical data in algebraic geometry. Submitted 2011.
- (30)W. Hao, J.D. Hauenstein, B. Hu, T. McCoy, and A.J. Sommese. Computing steady-state solutions for a free boundary problem modeling tumor growth by Stokes equation. Submitted 2011.
- (31)J.D. Hauenstein and V. Levandovskyy. Certifying solutions to square systems of polynomial-exponential equations. Submitted 2011.
- (32)D. Mehta, M. Kastner, and J.D. Hauenstein. Energy landscape analysis of the two-dimensional nearest-neighbor ϕ^4 model. Submitted 2012.
- (33)D. Mehta, Y.-H. He, and J.D. Hauenstein. Numerical algebraic geometry: a new perspective on string and gauge theories. Submitted 2012.
- (34)J.D. Hauenstein and C.W. Wampler. Numerically intersecting algebraic varieties via witness sets. Submitted 2012.
- (35)Z.A. Griffin and J.D. Hauenstein. Real solutions to systems of polynomial equations and parameter continuation. Submitted 2012.

EXTENDED ABSTRACTS

- (36)J.D. Hauenstein, N. Hein, C.J. Hillar, A. Martin Del Campo, F. Sottile, and Z. Teitler. The monotone secant conjecture in the real Schubert Calculus, 2011. Accepted to MEGA2011 and presented by A. Martin Del Campo.

SOFTWARE

- (1) D.J. Bates, J.D. Hauenstein, A.J. Sommese, and C.W. Wampler. Bertini: Software for numerical algebraic geometry. Available at www.nd.edu/~sommese/bertini.
- (2) J.D. Hauenstein and F. Sottile. alphaCertified: Software for certifying numerical solutions to polynomial equations. Available at math.tamu.edu/~sottile/research/stories/alphaCertified.

ADVISING

Zachary A. Griffin, Undergraduate Research, Texas A&M University, September 2011 – current.
Supported by NSF DMS 1114336.

INVITED PRESENTATIONS

Software for numerical algebraic geometry, Simons Foundation Roundtable on Software for Research, New York City, May 2012.

Parameterized system of equations, Midwest Numerical Analysis Days 2012, University of Notre Dame, May 2012.

Certification and applications of solutions to polynomial-exponential systems, From Dynamics to Complexity: A Conference Celebrating the Work of Mike Shub, Fields Institute, May 2012.

Real solving and certification, Algebra Seminar, Georgia Tech, April 2012.

Symbolic-numeric methods for systems of polynomial equations, North Carolina State University, January 2012.

Numerical solving of polynomial equations and applications, Mathematics Colloquium, University of Wisconsin, December 2011.

Numerical solving of polynomial equations: from 3264 and 1442 to 83200 and 38475, University of California, Berkeley, December 2011.

Certifying solutions to systems of polynomial-exponential equations, “Computational and Algorithmic Algebraic Geometry,” AMS Fall Western Section Meeting, University of Utah, October 2011.

Real solving and numerical algebraic geometry, “Advances in numerical algebraic geometry,” SIAM Conference on Applied Algebraic Geometry, North Carolina State University, October 2011.

Real solving and certification, “Real-number complexity,” Foundations of Computational Mathematics Conference, Budapest University of Technology and Economics, July 2011.

Computing real solutions using numerical algebraic geometry, RWTH Aachen University, June 2011.

Numerical algebraic geometry, Miami University, March 2011.

Multiplicity and a local dimension test, “Algebraic geometry: computations and applications,” Royal Institute of Technology (KTH), February 2011.

Solving polynomial systems using regeneration, “Solving polynomial equations,” CIAM Workshop, Royal Institute of Technology (KTH), February 2011.

Deflation and isosingular sets, Hybrid Methodologies for Symbolic-Numeric Computation, Mathematical Sciences Research Institute, November 2010.

Witness sets of projections, “Numerical Algebraic Geometry,” AMS Fall Central Section Meeting, University of Notre Dame, November 2010.

Regeneration and differential equations, “Geometric and numeric tools for differential equations,” Banff International Research Station, August 2010.

Regeneration and numerical algebraic geometry, “Kinematics and Numerical Algebraic Geometry,” SIAM Annual Meeting, Pittsburgh, July 2010.

Multiplicity, local dimension, and mechanism mobility, FRAGMENT Seminar, Colorado State University, March 2010.

Regeneration and applications of numerical algebraic geometry, FRAGMENT Seminar, Colorado State University, March 2010.

Numerical algebraic geometry, “Convex Algebraic Geometry,” Banff International Research Station, February 2010.

Applying numerical algebraic geometry to zebrafish patterning and tumor growth models, Numerical Analysis Seminar, Texas A&M University, February 2010.

Computing Hilbert functions using dual bases, “Applications of Algebraic Geometry,” AMS National Meeting, San Francisco, January 2010.

Algebraic computations using numerical dual bases, “Oberwolfach Seminar: New Trends in Algorithms for Real Algebraic Geometry,” Mathematisches Forschungsinstitut Oberwolfach, November 2009.

Finite games, homotopy continuation, and numerical algebraic geometry, Combinatorics and Probability Seminar, University of Pennsylvania, October 2009.

Homotopy continuation and numerical algebraic geometry, Postdoctoral Seminar Series, Fields Institute, October 2009.

Numerical algebraic geometry and its applications, University of Central Oklahoma, January 2009.

Algorithms of numerical algebraic geometry and Bertini, CIAM Tutorial, Royal Institute of Technology (KTH), June 2008.

Homotopy continuation and intersecting algebraic sets without defining equations, Graduate Student Seminar, University of Notre Dame, October 2007.

Regeneration, adaptive multiprecision, and Bertini, “Numerical and Symbolic Techniques in Algebraic Geometry and Its Applications,” AMS Fall Central Section Meeting, DePaul University, October 2007.

Parallel solving of polynomial systems, Center for Research Computing Workshop on Scientific Computing, University of Notre Dame, May 2007.

An introduction to multiobjective optimization and its application to finite games, “Optimization Theory and Applications,” AMS Spring Central Section Meeting, Miami University, March 2007.

SEMINARS AND SESSIONS ORGANIZED

Minisymposium on *Numerical algebraic geometric algorithms for kinematics and PDE applications*, 2012 SIAM Annual Meeting, Minneapolis, July 2012.

Minisymposium on *Advances in Numerical Algebraic Geometry*, SIAM Conference on Applied Algebraic Geometry, North Carolina State University, October 2011.

Algebraic Geometry Seminar, Texas A&M University, Spring 2012, Fall 2011, and Fall 2010.

Special session on *Numerical Algebraic Geometry* (with D.J. Bates, A.J. Sommese, and C.W. Wampler), AMS Fall Central Section Meeting, University of Notre Dame, November 2010.

OTHER CONFERENCES AND WORKSHOPS ATTENDED

Texas Algebraic Geometry Symposium, Texas A&M University, April 2012.

MEGA2011: Effective Methods in Algebraic Geometry, Stockholm University, May 2011 – June 2011.

Texas Algebraic Geometry Symposium, University of Texas, April 2010.

Mathematical Developments Arising from Biology, Mathematical Biosciences Institute, November 2009.

Workshop on Complexity of Numerical Computation, Fields Institute, October 2009.

International Workshop on Model Reduction in Reacting Flows, University of Notre Dame, March 2009 – April 2009.

Joint Mathematics Meetings, Washington, D.C., January 2009.

International Conference on Scientific Computing, Las Vegas, Nevada, July 2008.

Foundations of Computational Mathematics Conference, City University of Hong Kong, June 2008.

Interactions of Classical and Numerical Algebraic Geometry, University of Notre Dame, May 2008.

SIAM Conference on Parallel Processing for Scientific Computing, Atlanta, Georgia, March 2008.

Spring Center for Applied Mathematics Workshop, University of Notre Dame, February 2008 – March 2008.

Symbolic-Numeric Computation International Workshop, University of Western Ontario, July 2007.

International Conference on Applications of Computer Algebra, Oakland University, July 2007.

Spring Center for Applied Mathematics Workshop, University of Notre Dame, March 2007.

Software for Algebraic Geometry Workshop, Institute for Mathematics and its Applications, October 2006.

Spring AMS Central Section Meeting, University of Notre Dame, April 2006.

Spring Center for Applied Mathematics Workshop, University of Notre Dame, March 2006.

REFEREEING HISTORY

ACM Transactions on Mathematical Software, Applied Mathematics and Computation, Computers & Mathematics with Applications, Contemporary Mathematics, Foundations of Computational Mathematics, Mathematics of Computation, Mechanism and Machine Theory, Numerical Algorithms, Journal of Software for Algebra and Geometry, ZAMM.

TEACHING EXPERIENCE

Engineering Mathematics I, Texas A&M University, Spring 2012 and Fall 2011.

Methods of Applied Mathematics I, Texas A&M University, Fall 2010.

Differential Equations, Texas A&M University, Spring 2010.

Principles of Finite Mathematics, University of Notre Dame, Spring 2008.

Calculus I, Miami University, Spring 2005 and Fall 2004.

Precalculus, Miami University, Spring 2004 and Fall 2003.

PEDAGOGICAL TRAINING

University of Notre Dame Mathematics Teaching Seminar, 2006.

Miami University Seminar in the Teaching of First-Year Mathematics and Statistics, 2003.

HONORS, AWARDS, SCHOLARSHIPS, AND FELLOWSHIPS

Student Led Award for Teaching Excellence (\$5000 award), Texas A&M University, Spring 2010.

Outstanding Graduate Student Teacher Award for Excellence in Teaching, Kaneb Center for Teaching and Learning, University of Notre Dame, 2009.

Graduate Fellow of the Center for Applied Mathematics, University of Notre Dame, 2007 – 2008.

University of Notre Dame University Fellowship, 2005 – 2006.

Graduate Assistant Effective Teacher Award in Mathematics and Statistics, Miami University, 2005.

Graduate Faculty Prize in Mathematics and Statistics, Miami University, 2005.

Miami University Graduate Summer Scholarship, 2005 and 2004.

Miami University Graduate Assistantship, 2003 – 2005.

Miami University Graduate School Academic Achievement Assistantship, 2003.

Ohio Board of Regents Graduate/Professional Fellowship, 2003 – 2004.

Outstanding Senior Majoring in Mathematics, University of Findlay, 2003.

Mathematics and Computer Science Horizons Award, University of Findlay, 2002 and 2001.

MEMBERSHIPS

American Mathematical Society (AMS)

Society for Industrial and Applied Mathematics (SIAM)

REFERENCES

Professor Andrew J. Sommese

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