

Andrew Kruse Gillette

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much more information at my website

Employment

Assistant Professor, Department of Mathematics, University of Arizona	2013–present
Member, Program in Applied Mathematics, University of Arizona	2014–present
Postdoctoral Scholar in Mathematics University of California, San Diego <i>advisor: Dr. Michael Holst, Chancellor's Associates Endowed Chair VIII</i>	2011–2013

Education

Ph.D. in Mathematics, University of Texas at Austin <i>advisor: Dr. Chandrajit Bajaj, Computational Applied Mathematics Chair in Visualization</i>	2011
B.A. in Mathematics, summa cum laude, Amherst College <i>advisor: Dr. Robert Benedetto, Department of Mathematics</i>	2004

Research Interests

Applied and numerical analysis; partial differential equations; finite element methods; multi-scale modeling; computational geometry and topology; scientific computing; cell and molecular modeling.

Grants

<i>NSF Computational Math Grant</i> , DMS-1522289, \$224,998, single PI.	2015–2018
<i>NSF Conference Grant</i> , DMS-1542183, \$25,000, co-PI (PI: Chunmei Wang, Georgia Tech)	2015
<i>AMS-Simons Travel Grant</i> , \$4000, single PI.	2012–2014

Refereed Journal Publications

- (17). A. Gillette, T. Kloefkorn, *Trimmed serendipity finite element differential forms*, Submitted. Preprint: arXiv:1607.00571, 2016.
16. A. Gillette, C. Gross, K. Plackowski, *Numerical studies of serendipity and tensor product elements for eigenvalue problems*, *Involve*, a journal of Mathematics, accepted & in press, 2017.
15. A. Gillette, M. Holst, Y. Zhu, *Finite element exterior calculus for evolution problems*, *ICMSEC Journal of Computational Mathematics*, accepted & in press, 2016.
14. A. Gillette, *Serendipity and tensor product affine pyramid finite elements*, *SMAI Journal of Computational Mathematics*, 2, pp. 215–228, 2016.
13. A. Gillette, A. Rand, C. Bajaj, *Construction of scalar and vector finite element families on polygonal and polyhedral meshes*, *Computational Methods in Applied Mathematics*, 16:4, pp. 667–683, 2016.
12. M. Floater, A. Gillette, *Nodal bases for the serendipity family of finite elements*, *Foundations of Computational Mathematics*, 17:4, pp. 879–893, 2016.
11. A. Gillette, A. Rand, *Interpolation error estimates for harmonic coordinates on polytopes*, *ESAIM: Mathematical Modelling and Numerical Analysis*, 50:3, pp. 651–676, 2016.
10. S. Christiansen, A. Gillette, *Constructions of some minimal finite element systems*, *ESAIM: Mathematical Modelling and Numerical Analysis*, 50:3, pp. 833–850, 2016.
9. K. Vincent, M. Gonzales, A. Gillette, C. Villongco, S. Pezzuto, J. Omens, M. Holst, A.D. McCulloch, *High-order interpolation methods for cardiac monodomain simulations*, *Frontiers in Physiology*, 6:217, 2015.

Refereed Journal Publications (continued)

8. M. Floater, A. Gillette, N. Sukumar, *Gradient bounds for Wachspress coordinates on polytopes*, SIAM Journal on Numerical Analysis, 52:1, pp. 515–532, 2014.
7. P. Kekenes-Huskey, A. Gillette, J.A. McCammon, *Predicting the influence of long-range molecular interactions on macroscopic-scale diffusion by homogenization of the Smoluchowski equation*, Journal of Chemical Physics, 140:17, article 174106, 2014.
6. P. Kekenes-Huskey, T. Liao, A. Gillette, J. Hake, Y. Zhang, A. Michailova, A.D. McCulloch, J.A. McCammon, *Molecular and sub cellular-scale modeling of nucleotide diffusion in the cardiac myofilament lattice*, Biophysical Journal, 105:9, pp. 2130–2140, 2013.
5. P. Kekenes-Huskey, A. Gillette, J. Hake, J. McCammon, *Finite element estimation of protein-ligand association rates with post-encounter effects: Applications to calcium binding in Troponin C and SERCA*, Computational Science and Discovery, 5:1, pp. 1–20, 2012.
4. A. Rand, A. Gillette, C. Bajaj, *Quadratic serendipity finite elements on polygons using generalized barycentric coordinates*, Mathematics of Computation, 83:290, pp. 2691–2716, 2014.
3. A. Rand, A. Gillette, C. Bajaj, *Interpolation error estimates for mean value coordinates*, Advances in Computational Mathematics, 39:2, pp. 327–347, 2013.
2. A. Gillette, A. Rand, C. Bajaj, *Error estimates for generalized barycentric interpolation*, Advances in Computational Mathematics, 37:3, pp. 417–439, 2012.
1. A. Gillette, C. Bajaj, *Dual formulations of mixed finite element methods*, Computer Aided Design, 43:10, pp. 1213–1221, 2010.

Refereed Conference Proceedings

7. A. Gillette, *Hermite and Bernstein style basis functions for cubic serendipity spaces on squares and cubes*, Proc. Approximation Theory XIV: San Antonio 2013, Springer, pp. 103–121, 2014.
6. A. Gillette, C. Bajaj, *A generalization for stable mixed finite elements*, Proc. ACM Symposium on Solid and Physical Modeling, Association for Computing Machinery, pp. 41–50., 2010.
5. C. Bajaj, A. Gillette, Q. Zhang, *Stable mesh decimation*, Proc. SIAM/ACM Joint Conf. on Geometric and Physical Modeling, Association for Computing Machinery, pp. 277–282., 2009.
4. C. Bajaj, A. Gillette, S. Goswami, B. Kwon, J. Rivera, *Complementary space for enhanced uncertainty and dynamics visualization*, chapter in ‘Topological Methods in Data Analysis and Visualization: Theory, Algorithms and Applications,’ Springer-Verlag, pp. 217–228., 2009.
3. C. Bajaj, A. Gillette, S. Goswami, *Topology based selection and curation of level sets*, chapter in ‘Topology-Based Methods in Visualization,’ Springer-Verlag, pp. 45–58, 2009.
2. C. Bajaj, A. Gillette, *Quality meshing of a forest of branching structures*, Proc. 17th International Meshing Roundtable, Springer-Verlag, pp. 433–449, 2008.
1. S. Goswami, A. Gillette, C. Bajaj, *Efficient Delaunay mesh generation from sampled scalar functions*, Proc. 16th International Meshing Roundtable, Springer-Verlag, pp. 495–511, 2007.

Other Publications

4. A. Gillette, A. Rand, *Shape quality for generalized barycentric interpolation*, chapter in ‘Generalized Barycentric Coordinates in Computer Graphics and Computational Mechanics’, K. Hormann, N. Sukumar, editors, CRC Press (in press) 2017.
3. A. Gillette, *Serendipity methods: Using mathematics to accelerate computation*, UA Mathematics Newsletter (for public audience), Fall 2014.
2. A. Gillette, *Stability of dual discretization methods for partial differential equations*, UT Austin Digital Repository, PhD Dissertation, 2011.
1. A. Gillette, *Notes on Discrete Exterior Calculus*, Technical Report, UT Austin, 2009.

Recent Poster Presentations

4. A. Gillette, T. Kloefkorn, *Trimmed Serendipity Finite Elements*, SIAM Conference on Computational Science and Engineering, 2017.
3. A. Gillette, *Serendipity and tensor product pyramid finite elements*, Advances in Mathematics of Finite Elements (Ivo Babuska 90th Birthday Conference), 2016.
- 2b. A. Gillette, A. Rand, *What is a good linear finite element... on a generic polytope?*, Advanced Numerical Methods in the Mathematical Sciences (Workshop at Texas A&M), 2015.
- 2a. A. Gillette, A. Rand, *What is a good linear finite element... on a generic polytope?*, SIAM Conference on Computational Science and Engineering, 2015.
1. A. Gillette, M. Floater, *Nodal basis functions for serendipity finite elements*, ICERM Workshop: Robust Discretization and Fast Solvers for Computable Multi-Physics Models, 2014.

Recent Invited Talks

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| “A ‘Fifth Column’ for the Periodic Table of Finite Elements”
Polytopal Element Methods in Mathematics and Engineering, Milan, Italy | 2017 |
| “A New Family of Conforming Finite Elements on Cubical Meshes”
University of Pittsburgh Computational Math Seminar, Pittsburgh, PA | 2016 |
| “The Serendipity Pyramid Finite Element”
Mathematics of Finite Elements and Applications, Brunel University, England | 2016 |
| “Generalized Barycentric Coordinates for Degenerate Geometry in Finite Element Methods”
Mathematics of Finite Elements and Applications, Brunel University, England | 2016 |
| “The State of the Art in Polytopal Finite Element Methods”
SIAM Conference on Analysis of Partial Differential Equations, Scottsdale, AZ. | 2015 |
| “The Rapidly Growing Zoo of Polytopal Finite Element Methods”
UC Berkeley Applied Mathematics Seminar, Berkeley, CA | 2015 |
| “Modern Directions in Finite Element Theory: Polytope Meshes and Serendipity Methods”
Portland State Mathematics Department Colloquium, Portland, OR | 2014 |
| “Multiscale Diffusion Modeling in Charged and Crowded Biological Environments”
Duke Math Biology Colloquium, Durham, NC | 2014 |
| “Gradient Bounds for Wachspress Coordinates on Polytopes”
8th International Conference on Curves and Surfaces, Paris, France | 2014 |
| “Generalized Barycentric Coordinate Finite Element Methods on Polytope Meshes”
CERMICS, Paris, France | 2014 |

Recent Contributed Talks

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| “What is a good linear finite element... on a generic polytope?”
13th US National Congress on Computational Mechanics, San Diego, CA. | 2015 |
| “Nodal Bases for the Serendipity Family of Finite Elements”
International Conference on Spectral and High Order Methods, Salt Lake City, UT. | 2014 |
| “Serendipity Basis Functions for Any Degree in Any Dimension”
<i>Isogeometric Analysis 2014: Integrating Design and Analysis</i> , Austin, TX. | 2014 |
| “Basis Functions for Serendipity Finite Element Methods”
<i>14th International Conference on Approximation Theory</i> , San Antonio, TX. | 2013 |

Workshop and Mini-symposium Co-organizer (recent)

Advances in Finite Element Methods for Computational Mechanics	2018
Polygonal and Polyhedral Discretizations in Computational Mechanics	2018
<i>13th World Congress on Computational Mechanics</i> , two mini-symposia	
Mathematics of Gravitational Wave Science	2018
<i>Joint Mathematics Meetings</i> , AMS Special Session	
Advances in Quadrilateral and Hexahedral Finite Elements (poster collection)	2017
<i>SIAM Computational Science and Engineering</i>	
Polytopal Element Methods in Mathematics and Engineering (special workshop)	2015
Co-organizer; 24 speakers and 54 participants, including many non-US researchers.	

Professional Service

Reviewer

AMS Mathematical Reviews; Mathematics of Computation; Numerische Mathematik; ICMSEC
 Journal of Computational Mathematics; SIAM Numerical Analysis; SIAM Scientific Computing;
 Finite Elements in Analysis and Design; SIGGRAPH; SIGGRAPH Asia; ESAIM: Mathematical
 Modelling and Numerical Analysis; Int'l Journal for Numerical Methods in Engineering; Journal
 of Aerospace Engineering; ACM Transactions on Mathematical Software; Computer Methods in
 Applied Mechanics and Engineering; Computer Aided Design; Mathematische Zeitschrift; others.

Program Committee Member, Geometric Modeling and Processing	2016, 2017
Guest Editor, Computer Aided Geometric Design Special Issue: GMP2015	2015
Program Co-Chair, 9th International Conference on Geometric Modeling and Processing	2015
Panelist, National Science Foundation	

Outreach to K-12 Teachers

Instructor, Tucson Math Teachers' Circle Session	2016, 2017
Planned and led research-inspired activities for Southern Arizona teachers.	
K-12 Alliance Professional Development Institute, Montebello, CA	2007, 2008
Taught week-long activity-based seminar for math teachers of grades 3-9.	

Teaching

Exploring and Understanding Data (new UA course)	fall 2017
Linear Algebra	fall 2016
Principles of Analysis (graduate core course)	2014–2016
Discrete Mathematics in Computer Science	spring 2014
Calculus I	fall 2013
Vector Calculus (<i>Lecturer, UC San Diego</i>)	spring 2012
Precalculus (<i>Instructor, UT Austin</i>)	2009–2010
Calculus (<i>Teaching Assistant, UT Austin</i>)	2005–2007

Membership

AMS, SIAM, Council on Undergraduate Research, Budapest Semesters in Mathematics (alumnus)

Personal

I enjoy running, photography, travel, and live music. I am also an avid jazz fan.