

# Andrew Kruse Gillette

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*much more information at my website*

## Employment

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

## Education

Ph.D. in Mathematics, <b>University of Texas at Austin</b> <i>advisor: Dr. Chandrajit Bajaj, Computational Applied Mathematics Chair in Visualization</i>	2011
B.A. in Mathematics, summa cum laude, <b>Amherst College</b> <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, \$225,000, 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, C. Gross, K. Plackowski, *Numerical studies of serendipity and tensor product elements for eigenvalue problems*, Submitted. Preprint: arXiv:1612.00066, 2016.
- (16). A. Gillette, T. Kloefkorn, *Trimmed serendipity finite element differential forms*, Submitted. Preprint: arXiv:1607.00571, 2016.
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, accepted & in press, 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, (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**

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

**Recent Contributed Talks**

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

**Service and Leadership**

Invited paper reviewer	ongoing
AMS Mathematical Reviews; Mathematics of Computation; 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; GMP program committee (2016, 2017); others.	
Instructor, Tucson Math Teachers' Circle (2 hour session)	2016
Guest Editor, Computer Aided Geometric Design Special Issue: GMP2015	2015
Program Co-Chair, 9th International Conference on Geometric Modeling and Processing	2015
Colloquium Chair, University of Arizona Mathematics Department	2014–2015
Texas Interdisciplinary Plan and Longhorn Scholars Instructor	2009–2010
Programs to help under-prepared / under-represented students transition to college.	
K-12 Alliance Professional Development Institute, Montebello, CA	2007, 2008
Taught week-long activity-based seminar for math teachers of grades 3-9.	

**Workshop and Mini-symposium Co-organizer (recent)**

Polytopal Element Methods in Mathematics and Engineering (special workshop)	2015
Co-organizer; 24 speakers and 54 participants, including many non-US researchers.	
Polygonal and Polyhedral Discretizations in Computational Mechanics	2015
<i>13th U.S. National Congress on Computational Mechanics</i> , mini-symposium	
High Order Finite Difference and Finite Element Methods	2014
<i>International Conference on Spectral and High Order Methods</i> , mini-symposium	

**Awards and Fellowships**

J. Tinsley Oden Faculty Fellowship Research Program, UT Austin, \$1,543	2012
Best Paper Award, ACM Symposium on Solid and Physical Modeling	2010
UT Austin Graduate School Continuing Fellowship, \$26,251	2010–2011
Frank Gerth III Teaching Excellence Award, UT Austin, \$1,000	2010
Bruton Fellowship, UT Austin, \$1,000	2007
Regents Endowed Graduate Fellowship in Mathematics, UT Austin, \$5,000	2005–2006
Robert H. Breusch Prize, Department of Mathematics, Amherst College, \$700	2004
Budapest Semesters in Mathematics, Alfréd Rényi Institute of Mathematics, Hungary	2002

**Teaching**

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

**Personal**

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