

## Evan S. Gawlik

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CONTACT INFORMATION	Department of Mathematics and Computer Science Santa Clara University 500 El Camino Real Santa Clara, CA 95053	egawlik@scu.edu <a href="https://webpages.scu.edu/ftp/egawlik/">https://webpages.scu.edu/ftp/egawlik/</a>
EDUCATION	Ph.D., Stanford University, 2015 Department: Computational and Mathematical Engineering Thesis: Design and Analysis of Numerical Methods for Free- and Moving-Boundary Problems Thesis Advisor: Adrian J. Lew  B.S., California Institute of Technology (Caltech), 2010 Major: Applied and Computational Mathematics Minor: Control and Dynamical Systems	
EXPERIENCE	Associate Professor, Department of Mathematics and Computer Science, Santa Clara University, 2024-present  Associate Professor, Department of Mathematics, University of Hawaii at Manoa, 2023-2024  Assistant Professor, Department of Mathematics, University of Hawaii at Manoa, 2018-2023  NSF Postdoctoral Fellow, Department of Mathematics, University of California, San Diego, 2017-2018  RTG Postdoctoral Fellow, Department of Mathematics, University of California, San Diego, 2015-2017	
FUNDING	NSF Grant, “Collaborative Research: Numerical Methods and Differential Geometry” (DMS-2411208), \$190,527, 2024-2027. (Collaboration with Yakov Berchenko-Kogan).  Simons Foundation Travel Support for Mathematicians Award, “Finite Element Discretizations of Riemannian Geometry” (MPS-TSM-00002615), \$42,000, 2023-2028.  NSF Grant, “Computational Riemannian Geometry: High-Order Methods, Analysis, and Structure Preservation” (DMS-2012427), \$135,304, 2020-2023.  NSF Mathematical Sciences Postdoctoral Research Fellowship, “Finite Element Discretizations of Evolution Equations in Riemannian Geometry” (DMS-1703719), \$150,000, 2017-2020.	
PREPRINTS	E. S. Gawlik, F. Gay-Balmaz, & B. Manach-Pérennou. Structure-Preserving and Thermodynamically Consistent Finite Element Discretization for Visco-Resistive MHD with Thermoelectric Effect. (arXiv:2503.01239).  E. S. Gawlik & J. McKee. Intrinsic Finite Element Error Analysis on Manifolds with Regge Metrics, with Applications to Calculating Connection Forms. (arXiv:2410.15579).  E. S. Gawlik. Iterations for the Unitary Sign Decomposition and the Unitary Eigendecomposition. (arXiv:2011.12449).	

E. S. Gawlik & Y. Nakatsukasa. Zolotarev's Fifth and Sixth Problems. (arXiv:2011.10877).

#### PUBLICATIONS

- E. S. Gawlik & M. Neunteufel. Finite Element Approximation of the Einstein Tensor. *IMA Journal of Numerical Analysis*, to appear (2025).
- Y. Berchenko-Kogan & E. S. Gawlik. Blow-up Whitney Forms, Shadow Forms, and Poisson Processes. *Results in Applied Mathematics*, special issue on Hilbert Complexes, **25**, 100529 (2025).
- E. S. Gawlik & M. Neunteufel. Finite Element Approximation of Scalar Curvature in Arbitrary Dimension. *Mathematics of Computation*, to appear (2024).
- E. S. Gawlik & F. Gay-Balmaz. Variational and Thermodynamically Consistent Finite Element Discretization for Heat Conducting Viscous Fluids, *Mathematical Models and Methods in Applied Sciences*, **34**(2), 243-284 (2024).
- Y. Berchenko-Kogan & E. S. Gawlik. Finite Element Approximation of the Levi-Civita Connection and its Curvature in Two Dimensions. *Foundations of Computational Mathematics*, **24**, 587-637 (2024).
- E. S. Gawlik & F. Gay-Balmaz. A Finite Element Method for MHD that Preserves Energy, Cross-Helicity, Magnetic Helicity, Incompressibility, and  $\text{div } \mathbf{B} = 0$ . *Journal of Computational Physics*, **450**, 110847 (2022).
- E. S. Gawlik, M. J. Holst, & M. W. Licht. Local Finite Element Approximation of Sobolev Differential Forms. *ESAIM: Mathematical Modelling and Numerical Analysis*, **55**(5), 2075-2099 (2021).
- E. S. Gawlik & F. Gay-Balmaz. A Structure-Preserving Finite Element Method for Compressible Ideal and Resistive MHD. *Journal of Plasma Physics*, **87**(5), 835870501 (2021).
- E. S. Gawlik & Y. Nakatsukasa. Approximating the  $p$ th Root by Composite Rational Functions. *Journal of Approximation Theory*, **266**, 105577 (2021).
- E. S. Gawlik & F. Gay-Balmaz. A Variational Finite Element Discretization of Compressible Flow. *Foundations of Computational Mathematics*, **21**, 961-1001 (2021).
- E. S. Gawlik. Rational Minimax Iterations for Computing the Matrix  $p$ th Root. *Constructive Approximation*, **54**, 1-34 (2021).
- F. Gay-Balmaz & E. S. Gawlik. Geometric Variational Finite Element Discretizations for Fluids. *IFAC PapersOnLine*, **54**(19), 8-12 (2021).
- E. S. Gawlik. High-Order Approximation of Gaussian Curvature with Regge Finite Elements. *SIAM Journal on Numerical Analysis*, **58**(3), 1801-1821 (2020).
- E. S. Gawlik & F. Gay-Balmaz. A Conservative Finite Element Method for the Incompressible Euler Equations with Variable Density. *Journal of Computational Physics*, **412**, 109439 (2020).
- E. S. Gawlik. Finite Element Methods for Geometric Evolution Equations. In: F. Nielsen & F. Barbaresco (Eds.), *Geometric Science of Information*, Lecture Notes in Computer Science, Springer, Cham, Switzerland (2019).

- E. S. Gawlik. Zolotarev Iterations for the Matrix Square Root. *SIAM Journal on Matrix Analysis and Applications*, **40**(2), 696-719 (2019).
- E. S. Gawlik, Y. Nakatsukasa, & B. D. Sutton. A Backward Stable Algorithm for Computing the CS Decomposition via the Polar Decomposition. *SIAM Journal on Matrix Analysis and Applications*, **39**(3), 1448-1469 (2018).
- E. S. Gawlik & M. Leok. High-Order Retractions on Matrix Manifolds Using Projected Polynomials. *SIAM Journal on Matrix Analysis and Applications*, **39**(2), 801-828 (2018).
- E. S. Gawlik & M. Leok. Embedding-Based Interpolation on the Special Orthogonal Group. *SIAM Journal on Scientific Computing*, **40**(2), A721-A746 (2018).
- E. S. Gawlik & M. Leok. Interpolation on Symmetric Spaces via the Generalized Polar Decomposition. *Foundations of Computational Mathematics*, **18**(3), 757-788 (2018).
- E. S. Gawlik & M. Leok. Iterative Computation of the Fréchet Derivative of the Polar Decomposition. *SIAM Journal on Matrix Analysis and Applications*, **38**(4), 1354-1379 (2017).
- M. M. Chiaramonte, E. S. Gawlik, H. Kabaria, & A. J. Lew. Universal Meshes for the Simulation of Brittle Fracture and Moving Boundary Problems. In: K. Weinberg & A. Pandolfi (Eds.), *IUTAM Symposium on Innovative Numerical Approaches for Materials and Structures in Multi-Field and Multi-Scale Problems*, Lecture Notes in Applied and Computational Mechanics, Springer, Berlin, Germany (2016).
- E. S. Gawlik & A. J. Lew. Unified Analysis of Finite Element Methods for Problems with Moving Boundaries. *SIAM Journal on Numerical Analysis*, **53**(6), 2822-2846 (2016).
- E. S. Gawlik, H. Kabaria, & A. J. Lew. High-Order Methods for Low Reynolds Number Flows around Moving Obstacles Based on Universal Meshes. *International Journal for Numerical Methods in Engineering*, **104**(7), 513-538 (2015).
- E. S. Gawlik & A. J. Lew. Supercloseness of Orthogonal Projections onto Nearby Finite Element Spaces. *ESAIM: Mathematical Modelling and Numerical Analysis*, **49**(2), 559-576 (2015).
- E. S. Gawlik & A. J. Lew. High-Order Finite Element Methods for Moving-Boundary Problems with Prescribed Boundary Evolution. *Computer Methods in Applied Mechanics and Engineering*, **278**, 314-346 (2014).
- M. Desbrun, E. S. Gawlik, F. Gay-Balmaz, & V. Zeitlin. Variational Discretization for Rotating Stratified Fluids. *Discrete and Continuous Dynamical Systems - Series A*, **34**(2), 477-509 (2014).
- A. J. Lew, R. Rangarajan, M. J. Hunsweck, E. S. Gawlik, H. Kabaria, & Y. Shen. Universal Meshes: Enabling High-Order Simulation of Problems with Moving Domains. *IACM Expressions, Bulletin for the International Association of Computational Mechanics*, **32**, 12-16 (2013).
- E. S. Gawlik, T. Munson, J. Sarich, & S. Wild. The TAO Linearly-Constrained Augmented Lagrangian Method for PDE-Constrained Optimization. Argonne National Laboratory Technical Report, ANL/MCS-P2003-0112 (2012).
- E. S. Gawlik, P. Mullen, D. Pavlov, J. E. Marsden, & M. Desbrun. Geometric, Variational Discretization of Continuum Theories. *Physica D*, **240**(21), 1724-1760 (2011).

- E. S. Gawlik, J. E. Marsden, P. Du Toit, & S. Campagnola. Lagrangian Coherent Structures in the Planar Elliptic Restricted Three-Body Problem. *Celestial Mechanics and Dynamical Astronomy* **103**, 227-249 (2009).
- E. S. Gawlik, J. E. Marsden, S. Campagnola, & A. Moore. Invariant Manifolds, Discrete Mechanics, and Trajectory Design for a Mission to Titan. 19<sup>th</sup> AAS/AIAA Space Flight Mechanics Meeting, Savannah, Georgia. AAS 09-226, 1887-1903 (2009).
- S. Yockel, E. S. Gawlik, & A. K. Wilson. Structure and Stability of the Organo-Noble Gas Molecules XNgCCX and XNgCCNgX (Ng = Kr, Ar; X = F, Cl). *Journal of Physical Chemistry A*, **111**, 11261-11268 (2007).

## TEACHING

### *Courses taught:*

Calculus and Analytic Geometry IV (Math 14), Santa Clara University, Fall 2024  
 Calculus II (Math 242), UH Manoa, Spring 2024  
 Linear Algebra and Differential Equations (Math 307), UH Manoa, Spring 2024  
 Numerical Analysis (Math 607), UH Manoa, Fall 2023  
 Linear Algebra and Differential Equations (Math 307), UH Manoa, Spring 2023  
 Linear Algebra and Differential Equations (Math 307), UH Manoa, Fall 2022  
 Calculus II (Math 242), UH Manoa, Fall 2022  
 Numerical Analysis (Math 407), UH Manoa, Spring 2022  
 Calculus II (Math 242), UH Manoa, Spring 2022  
 Ordinary and Partial Differential Equations (Math 603), UH Manoa, Fall 2021  
 Numerical Analysis (Math 607), UH Manoa, Spring 2021  
 Calculus II (Math 242), UH Manoa, Fall 2020  
 Linear Algebra and Differential Equations (Math 307), UH Manoa, Fall 2020  
 Numerical Analysis (Math 407), UH Manoa, Spring 2020  
 Ordinary and Partial Differential Equations (Math 603), UH Manoa, Fall 2019 (co-instructor)  
 Numerical Analysis (Math 607), UH Manoa, Spring 2019  
 Partial Differential Equations I (Math 402), UH Manoa, Fall 2018  
 Introduction to Differential Equations (Math 20D), UCSD, Spring 2017  
 Calculus & Analytic Geometry for Science and Engineering (Math 20C), UCSD, Winter 2017  
 Introduction to Numerical Analysis (Math 170A), UCSD, Fall 2016  
 Linear Algebra (Math 20F), UCSD, Spring 2016  
 Calculus III (Math 10C), UCSD, Winter 2016  
 Calculus I (Math 10A), UCSD, Fall 2015

### *Short courses taught (1 week long):*

Numerical Methods for Ordinary Differential Equations, AHPCRC Summer Institute for Undergraduates, Stanford, Summer 2013 & 2014

### *Courses TA'd:*

Engineering Functional Analysis and Finite Elements (CME 356), Stanford, Spring 2015  
 Information and Logic (IST 4), Caltech, Spring 2008, 2009, & 2010

## PRESENTATIONS, POSTERS, AND WORKSHOPS

Banff International Research Station Workshop on “Geometric Mechanics Formulations for Continuum Mechanics”, Banff, Alberta, Canada, 2025  
 Joint Mathematics Meetings, Seattle, Washington, 2025  
 NSF CompMath PI Meeting, Seattle, Washington, 2024  
 Joint Mathematics Meetings, San Francisco, California, 2024  
 TU Dresden International Workshop on “Vector- and Tensor-Valued Surface PDEs,” Dresden, Germany, virtual talk, 2023  
 International Congress on Industrial and Applied Mathematics, Tokyo, Japan, 2023  
 International Conference on Spectral and High Order Methods, Seoul, South Korea, 2023  
 U.S. National Congress on Computational Mechanics, Albuquerque, New Mexico, 2023

NGSolve User Meeting, Portland, Oregon, 2023  
 Foundations of Computational Mathematics Conference, Paris, France, 2023  
 Portland State University Applied and Computational Mathematics Seminar, Portland, Oregon, 2023  
 SciCADE International Conference on Scientific Computation and Differential Equations, Reykjavik, Iceland, 2022  
 SIAM Conference on the Mathematics of Planet Earth, Pittsburgh, Pennsylvania, virtual talk, 2022  
 Oberwolfach Workshop on “Hilbert Complexes: Analysis, Applications, and Discretizations”, Oberwolfach, Germany, 2022  
 Canadian Applied and Industrial Mathematics Society (CAIMS) Annual Meeting, Kelowna, British Columbia, Canada, 2022  
 European Congress on Computational Methods in Applied Sciences and Engineering, Oslo, Norway, 2022  
 University of Michigan Applied Math Seminar, virtual, 2022  
 SIAM-CAIMS Annual Meeting, virtual, 2020  
 Foundations of Computational Mathematics Conference, virtual, 2020  
 Princeton Center for Theoretical Science Workshop on “Structure-Preserving Geometric Discretization of Physical Systems”, Princeton, New Jersey, 2020  
 Oxford University Numerical Analysis Seminar, Oxford, England, 2019  
 European Numerical Mathematics and Advanced Applications Conference, Egmond aan Zee, The Netherlands, 2019  
 Isaac Newton Institute Program on “Geometry, Compatibility and Structure Preservation in Computational Differential Equations”, Cambridge, England, 2019  
 Geometric Science of Information Conference, Toulouse, France, 2019  
 SciCADE International Conference on Scientific Computation and Differential Equations, Innsbruck, Austria, 2019  
 International Congress on Industrial and Applied Mathematics, Valencia, Spain, 2019  
 Biennial Conference on Numerical Analysis, Glasgow, Scotland, 2019  
 AMS Spring Central and Western Joint Sectional Meeting, Honolulu, Hawaii, 2019  
 AIMS Conference on Dynamical Systems, Differential Equations, and Applications, Taipei, Taiwan, 2018  
 Oberwolfach Workshop on “Nonlinear Data: Theory and Algorithms”, Oberwolfach, Germany, 2018  
 CSU Long Beach Mathematics Seminar, Long Beach, California, 2018  
 Geometric Partial Differential Equations, General Relativity, and Finite Element Exterior Calculus Workshop, San Diego, California, 2018  
 UC Berkeley Applied Mathematics Seminar, Berkeley, California, 2017  
 Foundations of Computational Mathematics Conference, Barcelona, Spain, 2017  
 Biennial Conference on Numerical Analysis, Glasgow, Scotland, 2017  
 International Conference on Finite Elements in Flow Problems, Rome, Italy, 2017 (Keynote Lecture, Immersed Finite Elements in Fluid Flow Session)  
 University of Hawaii at Manoa, Mathematics Colloquium, 2017  
 University of Victoria, Mathematics and Statistics Colloquium, British Columbia, Canada, 2017  
 San Francisco State University, Mathematics Colloquium, 2017  
 Queen’s University, Mathematics and Statistics Colloquium, Ontario, Canada, 2017  
 University of Toronto, Mathematics Colloquium, Ontario, Canada, 2017  
 SIAM Annual Meeting, Boston, Massachusetts, 2016  
 Southern California Applied Mathematics Symposium, Claremont, California, 2016  
 U.S. National Congress on Computational Mechanics, San Diego, California, 2015  
 Engineering Mechanics Institute Conference, Stanford, California, 2015  
 Pan-American Congress on Computational Mechanics, Buenos Aires, Argentina, 2015  
 SIAM Conference on Computational Science and Engineering, Salt Lake City, Utah, 2015  
 California Institute of Technology, Computing and Mathematical Sciences Colloquium, 2015  
 University of Southern California, Aerospace and Mechanical Engineering Seminar, 2015

Columbia University, Applied Mathematics Colloquium, 2015  
 Bay Area Computational Mechanics Festival (Compfest), Stanford, California, 2014  
 World Congress on Computational Mechanics, Barcelona, Spain, 2014  
 International Conference on Spectral and High Order Methods, Salt Lake City, Utah, 2014  
 Università Cattolica del Sacro Cuore di Brescia, Italy, Department of Mathematics and  
 Physics Seminar, 2014  
 University of Pavia, Italy, Applied Mathematics Seminar, 2014  
 University of Maryland, College Park, Numerical Analysis Seminar, 2014  
 Bay Area Computational Mechanics Festival (Compfest), Berkeley, California, 2013  
 U.S. National Congress on Computational Mechanics, Raleigh, North Carolina, 2013  
 Carnegie Mellon University Center for Nonlinear Analysis Summer School on “Topics in  
 Nonlinear PDEs, Calculus of Variations, and Applications in Materials Science”, 2013  
 World Congress on Computational Mechanics, Sao Paulo, Brazil, 2012  
 NSF Partnership for International Research and Education (PIRE) Summer School on “New  
 Frontiers in Multiscale Analysis and Computing for Materials”, 2012  
 DOE Computational Science Graduate Fellowship Annual Conference, Arlington, Virginia,  
 2010, 2011, 2012, 2013, & 2014  
 Structured Integrators Workshop, University of California, San Diego, 2010  
 Caltech Information Science and Technology (IST) Lunch Bunch, Pasadena, California, 2010  
 American Astronautical Society/American Institute of Aeronautics and Astronautics Space  
 Flight Mechanics Meeting, Savannah, Georgia, 2009  
 National Conference on Undergraduate Research, 2007, 2008, & 2009  
 Southern California Conference on Undergraduate Research, 2006, 2007, & 2008  
 Caltech Summer Undergraduate Research Fellowship Seminar Day, Pasadena, California,  
 2006, 2007, 2008, & 2009  
 American Chemical Society Dallas-Fort Worth Meeting-in-Miniature, Dallas, Texas, 2005

#### HONORS AND AWARDS

##### *International Awards*

2<sup>nd</sup> Prize, Leslie Fox Prize in Numerical Analysis, 2017

##### *National Awards*

NSF Mathematical Sciences Postdoctoral Research Fellowship, 2017  
 DOE Computational Science Graduate Fellowship, 2010  
 NSF Graduate Fellowship, 2010  
 Finalist, Hertz Foundation Fellowship, 2010  
 Barry M. Goldwater Scholarship, Goldwater Foundation, 2006  
 National Merit Scholarship, 2006  
 9<sup>th</sup> in the Nation, Intel Science Talent Search, 2006  
 Semifinalist, Siemens-Westinghouse Competition in Math, Science, and Technology, 2006  
 Gold Prize, USA Mathematical Talent Search, 2005

##### *University Awards*

Juan Simo Outstanding Thesis Award, Stanford, 2015  
 George W. Housner Prize for Academic Excellence and Original Research, Caltech, 2010  
 Henry Ford II Scholarship, Caltech Engineering and Applied Science Division, 2009  
 Frederick J. Zeigler Memorial Award, Caltech Mathematics Department, 2008  
 Axline Merit Scholarship, Caltech, 2006

##### *Departmental Awards*

Departmental Teaching Award, Department of Mathematics, University of Hawaii at Manoa, 2024

##### *Travel Awards*

U.S. Junior Oberwolfach Fellow, 2022  
 SIAM Travel Award, 2019  
 U.S. Junior Oberwolfach Fellow, 2018

Foundations of Computational Mathematics Conference NSF Travel Grant, 2017  
 U.S. Association for Computational Mechanics Travel Award, 2012  
 John V. Breakwell Student Travel Award, American Astronautical Society, 2009

*Summer Research Fellowships*

Department of Energy Computational Science Practicum, Argonne National Laboratory, 2011  
 Caltech Summer Undergraduate Research Fellowship, 2006, 2007, 2008, & 2009  
 Texas Academy of Mathematics and Science Summer Research Scholarship, 2005

*Presentation, Paper, and Poster Awards*

Finalist, BGCE Student Paper Prize, SIAM Conference on Computational Science and Engineering, 2015  
 1<sup>st</sup> Place, Poster Contest, DOE Computational Science Graduate Fellowship Annual Conference, 2012  
 1<sup>st</sup> Place, Perpall Undergraduate Research Speaking Competition, Caltech, 2008  
 1<sup>st</sup> Place, Perpall Undergraduate Research Speaking Competition, Caltech, 2007  
 3<sup>rd</sup> Place, Perpall Undergraduate Research Speaking Competition, Caltech, 2006  
 3<sup>rd</sup> Place Presenter, Undergraduate Division, American Chemical Society Dallas-Fort Worth Meeting-in-Miniature, 2005

OUTREACH

*Volunteer at:*

Hawaii State Science Olympiad, “Codebusters” event, 2022, 2023, & 2024  
 “Be a Scientist Night” at Oahu’s Institute for Human Services, 2022  
 UH Manoa Experience Day, 2019

ADVISING

*Master’s students:*

Jason Greuling (graduated 2022)  
 Michael Stewart (graduated 2022)  
 Aaron Hagstrom (graduated 2021)

*Ph.D. students:*

Jack McKee, 2022-present

*Postdocs:*

Yakov (Yasha) Berchenko-Kogan, 2019-2021

SERVICE

*Minisymposium Organizer at:*

SIAM Annual Meeting, Spokane, Washington, 2024  
 Canadian Applied and Industrial Mathematics Society (CAIMS) Annual Meeting, Kelowna, British Columbia, Canada, 2022  
 Biennial Conference on Numerical Analysis, Glasgow, Scotland, 2019  
 AMS Spring Central and Western Joint Sectional Meeting, Honolulu, Hawaii, 2019

*Referee for:*

Numerische Mathematik, Foundations of Computational Mathematics, SIAM Journal on Numerical Analysis, SIAM Journal on Matrix Analysis and Applications, SIAM Journal on Scientific Computing, IMA Journal of Numerical Analysis, Journal of Scientific Computing, Journal of Computational Physics, Journal of Computational and Applied Mathematics, SMAI Journal of Computational Mathematics, Communications of the American Mathematical Society, Transactions of Mathematics and its Applications, BIT Numerical Mathematics, Applied Mathematics Letters, Advances in Computational Mathematics, Results in Applied Mathematics, Journal of Nonlinear Science, Journal of Computational Dynamics, International Journal for Numerical Methods in Engineering, Computers and Mathematics with Applications, Operators and Matrices, Journal of Geometric Mechanics, International Journal of Numerical Analysis and Modeling, International Journal

of Computer Mathematics, Optimization and Engineering, Engineering Applications of Computational Fluid Mechanics, Center for Turbulence Research Annual Research Briefs, Mathematics and Mechanics of Solids, Astrophysics and Space Science