

**Joseph M. Teran**  
Professor, University of California, Davis  
UC Davis Department of Mathematics, One Shields Avenue, Davis, CA 95616  
*Email:* jteran@math.ucdavis.edu, *Phone:* (310) 869-9641

### **Professional Preparation**

*Postdoctoral Institution:* Courant Institute of Mathematical Sciences. (2005-2007)

*Graduate Institution:* Stanford University. Degree: Ph.D. 2005

*Undergraduate Institution:* University of California, Davis. Degree: B.S. 2000

### **Appointments**

*Professor:* Department of Mathematics, UC Davis (November 2020-present)

*Professor:* Department of Mathematics, UCLA (July 2014-October 2020)

*Associate Professor:* Department of Mathematics, UCLA (July 2011-June 2014)

*Assistant Professor:* Department of Mathematics, UCLA (July 2007-June 2011)

*Postdoctoral researcher:* Courant Institute of Mathematical Sciences (September 2005-June 2007)

### **Awards**

- Stanford University, Distinguished Alumni Scholar, Computer Science, 2012.
- Presidential Early Career Award for Scientists and Engineers (PECASE), 2011.
- Office of Naval Research, Young Investigator Award, 2010.
- Discover Magazine, Top 20 Scientists Under 40, 2008.
- National Science Foundation Mathematical Sciences Postdoctoral Research Fellowship, 2005-2007.
- National Science Foundation Graduate Research Fellowship, 2000-2003.

### **Current Research Support**

- Department of Energy/Oak Ridge National Laboratory (DE-AC05-00OR22725) A High Performance Computing Model of Powder-Scale Melting and Solidification Simulations in Additive Manufacturing

### **Prior Research Support**

- Department of Energy/Sandia National Laboratories (1655264) Fast and Conservative Contact Algorithms based on Particle-In-Cell Grid Transfers.
- National Science Foundation (CCF-1422795) RI: Small: Collaborative Research: An accelerated numerical solver framework for simulation of solid-fluid dynamics.
- Office of Naval Research (N00014-12-1-083) Computational Solids and Fluids in Real and Interactive Time.
- Office of Naval Research (N00014-11-1-0719): Sparse Numerical Methods for Compressible Flow Calculations Using Radial Basis Functions and  $l_1$  Minimization.
- Intel Science and Technology Centers - Visual Computing Grant.
- Office of Naval Research (N00014-10-1-0730): Young Investigator Award, Manycore Accelerated Algorithms for Computational Solid and Fluid Mechanics.
- National Science Foundation (DMS-0914813), A Novel Framework for Fluid/Structure Interaction in Subject-Specific Surgical Simulations Involving Elastic Cardiac Geometries.
- National Science Foundation (CCF-0830554), Theoretical Foundations: An Optimization Framework for the Estimation of Material Properties of Deformable Materials from Volumetric Measurements.
- National Science Foundation (DMS-0652427), FRG: Collaborative Research: Dynamics of Elastic Biostructures in Complex Fluids.
- Office of Naval Research (N000140310071): Level Set Methods for Fracture and Failure of Materials.
- UC Laboratory Research Program: Multiscale Methods of Fracture and Multimaterial Debris Flow.
- Intel Larrabee Research Grant.

### **Collaborators and Other Affiliations**

- *Graduate and Postdoctoral Advisors*: Ronald Fedkiw, Michael Shelley, Charles Peskin.
- *Ph.D. students*: Zhenhan Zhao (UC Davis), Benjamin Godkin (UC Davis), Zhan Zhang (UC Davis, jointly advised with Julian Panetta), Kai Lan (UC Davis, jointly advised with Julian Panetta), Yushan Han (UCLA), Yizhou Chen (UCLA), Jingyu Chen (UCLA), Elias Guiedon (UCLA), Victoria Kala (UCLA), Osman Akar (UCLA).
- *Former students*: Steven Gagniere, Ph.D. 2022, Alan Marquez Razon, Ph.D. 2021, Stephanie Wang, Ph.D. 2020, Xuchen Han, Ph.D. 2020, Qi Guo, Ph.D. 2020, Mengyuan Ding, Ph.D. 2020, Chuyuan Fu, Ph.D. 2018, Michael Royston, Ph.D. 2017, David Clyde, Ph.D. 2017, Andre Pradhana, Ph.D. 2016, Theodore Gast, Ph.D. 2016, Gergeley Klar, Ph.D. 2016, Daniel Ram, Ph.D. 2015, Chenfanfu Jiang, Ph.D. 2015, Yuting Wang, Ph.D. 2014, Russell Howes, Ph.D. 2013, Jan Hegemann, Ph.D. 2013, Alexey Stomakhin, Ph.D. 2013, Diego Assencio, Ph.D. 2012, Jeffrey Hellrung, Ph.D. 2012, Alejandro Cantarero, Ph.D. 2011, Aleka McAdams, Ph.D. 2011, Jacob Bedrossian, Ph.D. 2011, Yongning Zhu, Ph.D. 2010.

### Professional Service

- *MSRI, Human Resources Advisory Committee, 2016-2018*: Recruitment of and program development for underrepresented-groups in the NSF MSRI at UC Berkeley.
- *Organizing Committee, UCLA/IPAM Latmath Conference, 2017*: Development of program and speaker recruitment for inaugural NSF IPAM sponsored conference for Lantinx mathematicians.
- *UCLA Physical Sciences Diversity Committee, 2017-2020*: Development of diversity requirement for physical sciences majors as well as annual meetings for underrepresented students.
- *ACM SIGGRAPH Asia Papers Committee, 2018-2019, 2021*: Committee to establish acceptance of papers to the ACM Transactions on Graphics issue associated with the annual ACM SIGGRAPH Asia conference.
- *ACM SIGGRAPH Papers Committee, 2010, 2013-2014*: Committee to establish acceptance of papers to the ACM Transactions on Graphics issue associated with the annual ACM SIGGRAPH conference.
- *ICIAM Pioneer Prize Subcommittee, 2023*.
- *AIM Scientific Boards, 2021-2022*.

### Plenary Talks, Invited Addresses, Distinguished Lectures

- Mathematics Colloquium, University of Arizona, December, 2021.
- Computer Science Colloquium, University of Peking, August, 2021.
- Frontiers in Applied Mathematics and Computation, Harvard University, March 2021.
- National Math Festival, April, 2021.
- Mathematics, Statistics, and Computer Science Colloquium, University of Illinois, Chicago, March, 2021.
- Math Across Campus Lecture, University of Washington, October 2019.
- Widely Applied Math Seminar, Harvard University, October 2019.
- Conference for the Advancement of Mathematics Teaching, Plenary Talk, San Antonio, July 2019.
- MAA Invited Address, Denver, August 2018.
- AMS Lecture at the SIAM Annual Meeting, Portland, July, 2018.
- Meshfree and Particle Methods: Applications and Theory, Santa Fe, Plenary Talk, September 2018.
- Prosser Lecture, Mathematics Department, Dartmouth College, September, 2018.
- Claremont Colleges? Math Colloquium, Claremont, February, 2018.
- Institute for Mathematics and Its Applications (IMA) Public Lecture, December 2017.
- Caltech Computational Mathematics + X Seminar, November, 2017.
- Mathematical Field of Dreams Conference, Math Science Talk, St. Louis, November, 2017.
- Georgia Tech Frontiers in Science Lecture, September 2017.
- ACM Tapia 2016: Celebration of Diversity in Computing Conference, Plenary Talk, Austin, September, 2016.
- Smoky Mountains Computational Sciences and Engineering Conference, Opening Keynote Lecture, Gatlinburg, August 2016.

- European Consortium for Mathematics in Industry, Plenary Lecture, Santiago de Compostela, Spain, 2016.
- SIAM-SIAG PDE Conference, Plenary Talk, Phoenix, December, 2015.
- SIAM Annual Meeting, Invited Speaker, Chicago, July 2014.
- Rice University, Invited Lecture, October 2013.
- Blackwell-Tapia Conference, Invited Speaker, November 2012.
- Stanford University, Distinguished Alumni Lecture, June 2012.
- Institute for Applied Computational Science Seminar, Invited Talk, September, 2012.
- Scientific Computing Seminar, Invited Lecture Brown University, March 2012.
- International Congress on Industrial and Applied Mathematics, SIAM Workshop Celebrating Diversity, Invited Talk, Vancouver, Canada, July 2011.
- SIAM Conference on Computational Science and Engineering, Invited Talk, Philadelphia, July 2011.
- Mathematics Colloquium, Invited Talk, Worcester Polytechnic Institute, February 2011.
- Applied Math Seminar, Invited Talk, UC Berkeley, September, 2010.
- Mathematics Seminar, Invited Talk, Morehouse College, March 2008.

## Publications

- A. Kaneda, O. Akar, J. Chen, V. Kala, D. Hyde, J. Teran *Deep Conjugate Direction Method for Iteratively Solving Linear Systems*, arXiv preprint arXiv:2205.10763, 2022.
- S. Gagniere, Y. Han, Y. Chen, D. Hyde, A. Marquez-Razon, J. Teran, R. Fedkiw, *A Robust Grid-Based Meshing Algorithm for Embedding Self-Intersecting Surfaces*, arXiv preprint arXiv:2201.06256, 2022.
- Y. Jin and Y. Han and Z. Geng and J. Teran and R. Fedkiw *Analytically Integratable Zero-Restlength Springs for Capturing Dynamic Modes Unrepresented by Quasistatic Neural Networks*, ACM SIGGRAPH 2022 Conference Proceedings, 37, 1–9, 2022.
- J. Chen, V. Kala, A. Marquez-Razon, E. Gueidon, D. Hyde, J. Teran, *A Momentum-Conserving Implicit Material Point Method for Surface Tension with Contact Angles and Spatial Gradients*, ACM Transactions on Graphics (SIGGRAPH Asia 2021), 40, 4, 1-16, 2021.
- D. Hyde, S. Gagniere, A. Marquez-Razon, J. Teran. *An Implicit Updated Lagrangian Formulation for Liquids with Large Surface Energy*, ACM Transactions on Graphics (SIGGRAPH 2022), 36, 6, 1–13, 2020.
- S. Gagniere, D. Hyde, A. Marquez-Razon, C. Jiang and Z. Ge, X. Han, Q. Guo, J. Teran, *A Hybrid Lagrangian/Eulerian Collocated Velocity Advection and Projection Method for Fluid Simulation*, Computer Graphics Forum, 39, 8, 1–14, 2020.
- J. Gaume, A. van Herwijnen, T. Gast, J. Teran, C. Jiang, *Investigating the release and flow of snow avalanches at the slope-scale using a unified model based on the material point method*, Cold Regions Science and Technology, 168, 102847, 2019.
- X. Han, T. Gast, Q. Guo, S. Wang, C. Jiang, J. Teran, *A Hybrid Material Point Method for Frictional Contact with Diverse Materials*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), 2019.
- S. Wang, M. Ding, T. Gast, L. Zhu, S. Gagniere, C. Jiang, J. Teran, *Simulation and Visualization of Ductile Fracture with the Material Point Method*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), 2019.
- J. Gaume, T. Gast, J. Teran, A. van Herwijnen, C. Jiang, *Dynamic Anticrack Propagation in Snow*, Nature Communications, Volume 9, pp. 3047, 2018.
- Q. Guo, X. Han, C. Fu, T. Gast, R. Tamstorf, J. Teran, *A Material Point Method for Thin Shells with Frictional Contact*, ACM Transactions on Graphics (SIGGRAPH 2018), 37(4), pp. 147:1-147:15, 2018.
- M. Royston, A. Pradhana, B. Lee, Y. Chow, W. Yin, J. Teran, S. Osher, *Parallel Redistancing using the Hopf-Lax Formula*, Journal of Computational Physics, 365(1), pp. 7-17, 2018.
- C. Fu, Q. Guo, T. Gast, C. Jiang, J. Teran, *A Polynomial Particle-In-Cell Method*, ACM Transactions on Graphics (SIGGRAPH Asia 2017), 36(6), pp. 222:1-222:12, 2017.
- D. Clyde, J. Teran, R. Tamstorf, *Modeling and Data-Driven Parameter Estimation for Woven Fabrics*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), pp. 1-11, 2017.

- C. Jiang, T. Gast, J. Teran, *Anisotropic Elastoplasticity for Cloth, Knit and Hair Frictional Contact*, ACM Transactions on Graphics (SIGGRAPH 2017), 36(4), pp. 152:1-152:14, 2017.
- A. Pradhana, T. Gast, G. Klar, C. Fu, J. Teran, C. Jiang, K. Museth, *Multi-species Simulation of Porous Sand and Water Mixtures*, ACM Transactions on Graphics (SIGGRAPH 2017), 36(4), pp. 105:1-105:12, 2017.
- C. Jiang, C. Schroeder, J. Teran, *An Angular Momentum Conserving Affine-Particle-In-Cell Method*, Journal of Computational Physics, 338(1), pp. 137-164, 2017.
- G. Klar, T. Gast, A. Pradhana, C. Fu, C. Schroeder, C. Jiang, J. Teran, *Drucker-Prager Elastoplasticity for Sand Animation*, ACM Transactions on Graphics (SIGGRAPH 2015), 35(4), 2016.
- T. Gast, C. Schroeder, A. Stomakhin, C. Jiang, J. Teran, *Optimization Integrator for Large Time Steps*, IEEE Transactions on Visualization and Computer Graphics, 21(10) pp. 1103-1115, 2015.
- D. Ram, T. Gast, C. Jiang, C. Schroeder, A. Stomakhin, J. Teran, P. Kavehpour, *A Material Point Method for Viscoelastic Fluids, Foams and Sponges*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), pp. 157-163, 2015.
- C. Jiang, C. Schroeder, A. Selle, J. Teran, A. Stomakhin, *An Affine Particle-In-Cell Method*, ACM Transactions on Graphics (SIGGRAPH 2015), 34(4), pp. 51:1-51:10, 2015.
- Y. Wang, C. Jiang, C. Schroeder, J. Teran, *An Adaptive Virtual Node Algorithm with Robust Mesh Cutting*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), pp. 77-85, 2014.
- A. Stomakhin, C. Schroeder, C. Jiang, L. Chai, J. Teran, A. Selle, *Augmented MPM for phase-change and varied materials*, ACM Transactions on Graphics (SIGGRAPH 2014), 33(4), pp. 138:1-138:11, 2014.
- C. Schroeder, A. Stomakhin, R. Howes, J. Teran, *A Second Order Virtual Node Algorithm for Navier-Stokes Flow Problems with Interfacial Forces and Discontinuous Material Properties*, Journal of Computational Physics, 265, pp. 221-245, 2014.
- R. Howes, C. Schroeder, J. Teran, *A Virtual Node Algorithm for Hodge Decompositions of Inviscid Flow Problems with Irregular Domains*, Methods and Applications of Analysis, 20(4), pp. 439-455, 2013.
- J. Hegemann, C. Jiang, C. Schroeder, J. Teran, *A Level Set Method for Ductile Fracture*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), pp. 193-201, 2013.
- A. Stomakhin, C. Schroeder, L. Chai, J. Teran, A. Selle, *A Material Point Method for Snow Simulation*, ACM Transactions on Graphics (SIGGRAPH 2013), 32(4), pp. 102:1-102:10, 2013.
- D. Assencio, J. Teran, *A Second Order Virtual Node Algorithm for Stokes Flow Problems with Interfacial Forces, Discontinuous Material Parameters and Irregular Domains*, Journal of Computational Physics, 250(1), pp. 77-105, 2013.
- J. Hegemann, A. Cantarero, C. Richardson, J. Teran, *An Explicit Update Scheme for Inverse Parameter and Interface Estimation of Piecewise Constant Discontinuous Coefficients in Linear Elliptic PDEs*, SIAM Journal of Scientific Computing, 35(2), pp. A1098-A1119, 2013.
- A. Stomakhin, R. Howes, C. Schroeder, J. Teran, *Energetically Consistent Invertible Elasticity*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), pp. 25-32, 2012.
- Y. Zhu, Y. Wang, J. Hellrung, A. Cantarero, E. Sifakis, J. Teran, *A Second-Order Virtual Node Algorithm for Nearly Incompressible Linear Elasticity in Irregular Domains*, Journal of Computational Physics, 231(21), pp. 7092-7117, 2012.
- J. Hellrung, L. Wang, E. Sifakis, J. Teran, *A Second-Order Virtual Node Method for Elliptic Problems with Interfaces and Irregular Domains in Three Dimensions*, Journal of Computational Physics, 231(4), pp. 2015-2048, 2012.
- A. McAdams, A. Selle, R. Tamstorf, M. Embrey, J. Teran, E. Sifakis, *Efficient Elasticity for Character Skinning with Contact and Collisions*, ACM Transactions on Graphics (SIGGRAPH 2011), 30(4), pp.1-12, 2011.
- C. Richardson, J. Hegemann, E. Sifakis, J. Hellrung, J. Teran, *Simulating Crack Propagation with XFEM and a Hybrid Mesh*, International Journal for Numerical Methods in Engineering, 88(10), pp. 1042-1065, 2011.
- A. McAdams, E. Sifakis, J. Teran, *A Parallel Multigrid Poisson Solver for Fluids Simulation on Large Grids*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA) edited by M. Otaduy and Z. Popovic, pp.1-10, 2010.

- J. Teran, L. Fauci, M. Shelley, *Viscoelastic Fluid Response Can Increase the Speed and Efficiency of a Free Swimmer*, Physical Review Letters, 104(3), 038101, 2010.
- J. Bedrossian, J. Von Brecht, S. Zhu, E. Sifakis, J. Teran, *A Second Order Virtual Node Method for Poisson Interface Problems on Irregular Domains*, Journal of Computational Physics, 229, pp. 6405-6426, 2010.
- Y. Zhu, E., Sifakis, J. Teran, A. Brandt, *An Efficient Parallelizable Multigrid Framework for the Simulation of Elastic Solids*, ACM Transactions on Graphics (with presentation at SIGGRAPH 2010), 29(2), pp. 1-18, 2010.
- J. Hellrung, A. Selle, A. Shek, E. Sifakis, J. Teran, *Geometric Fracture Modeling in BOLT*, ACM SIGGRAPH 2009, Sketches and Applications.
- A. McAdams, K. Ward, E. Sifakis, A. Selle, J. Teran, *Detail Preserving Continuum Hair Simulation*, ACM Transactions on Graphics (SIGGRAPH 2009), 28(3), pp.385-392, 2009.
- J. Teran, C. Peskin, *Tether Force Constraints in Stokes Flow with the Immersed Boundary Method on a Periodic Domain*, SIAM Journal of Scientific Computing, 31(5), pp. 3404-3416, 2009.
- E. Sifakis, J. Hellrung, J. Teran, A. Oliker, C. Cutting. *Local Flaps: A Real-Time Finite Element Based Solution to the Plastic Surgery Defect Puzzle*, Studies in Health and Technology Informatics, 142, pp. 313-138, 2009.
- J. Teran, L. Fauci, M. Shelley, *Peristaltic Pumping and Irreversibility of a Stokesian Viscoelastic Fluid*, Physics of Fluids 20, 073101, 2008.
- E. Sifakis, S. Marino, J. Teran, *Globally Coupled Impulse-Based Collision Handling for Cloth Simulation*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA) edited by M. Gross and D. James, pp. 147-152, 2008.
- Z. Bao, J.-M. Hong, J. Teran, R. Fedkiw, *Fracturing Rigid Materials*, IEEE Transactions on Visualization and Computer Graphics, 13, pp. 370-378, 2007.
- R. Weinstein, J. Teran, R., Fedkiw, *Dynamic Simulation of Articulated Rigid Bodies with Contact and Collision*, IEEE Transactions on Visualization and Computer Graphics, 12, pp. 365-374, 2006.
- G. Irving, J. Teran, R. Fedkiw, *Tetrahedral and Hexahedral Invertible Finite Elements*, Graphical Models 68, pp. 66-89, 2006.
- R. Weinstein, J. Teran, R. Fedkiw, *Pre-stabilization for Rigid Body Articulation with Contact and Collision*, ACM SIGGRAPH 2005, Sketches and Applications.
- R. Bridson, J. Teran, N. Molino, R. Fedkiw, *Adaptive Physics Based Tetrahedral Mesh Generation Using Level Sets*, Engineering with Computers, 21 pp. 2-18, 2005
- S. Blemker, J. Teran, E. Sifakis, R. Fedkiw and S. Delp, *Fast 3D Muscle Simulations Using a New Quasistatic Invertible Finite-Element Algorithm*, International Symposium on Computer Simulation in Biomechanics, 2005.
- J. Teran, E. Sifakis, G. Irving and R. Fedkiw, *Robust Quasistatic Finite Elements and Flesh Simulation*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA) edited by K. Anjyo and P. Faloutsos, pp. 181-190, 2005.
- J. Teran, E. Sifakis, S. Blemker, V. Ng Thow Hing, C. Lau and R. Fedkiw, *Creating and simulating skeletal muscle from the Visible Human Data Set*, IEEE Transactions on Visualization and Computer Graphics, 11, pp. 317-328, 2005.
- G. Irving, J. Teran, R. Fedkiw, *Invertible Finite Elements for Robust Simulation of Large Deformation*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), edited by R. Boulic and D. Pai, pp. 131-140, 2004.
- N. Molino, R. Bridson, J. Teran, R. Fedkiw, *A Crystalline Red/Green Strategy for Meshing Highly Deformable Objects with Tetrahedra*, 12th International Meshing Roundtable, pp. 103-114, 2003.
- J. Teran, S. Blemker, V. Ng Thow Hing, R. Fedkiw, *Finite Volume Methods for the Simulation Skeletal Muscle*, ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA) edited by D. Breen and M. Lin, pp. 68-74, 2003.