Craig Schroeder

Curriculum Vitae

Department of Computer Science & Engineering
University of California, Riverside
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Research Interests

My research interests include computational fluid dynamics, solid mechanics, fluid-structure interaction, physically-based simulation for computer graphics, mathematical modelling, and scientific computing.

Education

- **Stanford University**, *Stanford, CA* *June 2011*
  - Ph.D. in Computer Science *Advisor: Ronald Fedkiw*
  - *Ph.D. Thesis:* "Coupled Simulation of Deformable Solids, Rigid Bodies, and Fluids with Surface Tension"
- **Drexel University**, *Philadelphia, PA* *June 2006*
  - M.S. in Computer Science *Advisor: Ali Shokoufandeh*
  - B.S. in Computer Science
  - B.S. in Mathematics
  - Summa Cum Laude; Cumulative G.P.A. 3.97
  - *Masters Thesis:* "Metric Tree Weight Adjustment and Infinite Complete Binary Trees As Groups"

Research Experience

- **Assistant Professor** *July 2016 to Present*
  University of California Riverside, Department of Computer Science & Engineering
- **Postdoctoral Scholar** *Advisor: Joseph Teran* *July 2011 to June 2016*
  University of California Los Angeles, Department of Mathematics
- **Graduate Research Assistant** *Advisor: Ronald FedkiwOctober 2006 to June 2011*
  Stanford University, Department of Computer Science
- **Research Intern** *Advisor: John Anderson* *June 2007 to June 2011*
  Pixar Animation Studios
- **Guest Researcher** *June 2006 to September 2006*
  Center for Computing Sciences, Bowie, MD
- **Guest Researcher** *Advisor: Ana Ivelisse Aviles* *June 2005 to September 2005*
  National Institute of Standards and Technology, Gaithersburg, MD

♦ **Undergraduate Research Assistant** *Advisor: William ReglJune 2002 to June 2005*
Drexel University, Department of Computer Science

Publications

- Bai, S. and **Schroeder, C.**, "Stability analysis of explicit MPM," ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), (In press).
- **Schroeder, C.**, Chowdhury, R. R., Shinar, T. "Local divergence-free polynomial interpolation on MAC grids," Journal of Computational Physics, (In press).
- Muzaffer, A., **Schroeder, C.**, Shinar, T. "Boundary pressure projection for partitioned solution of fluid-structure interaction with incompressible Dirichlet fluid domains," Journal of Computational Physics, 425, (2021).
- Sun, Y., Shinar, T., **Schroeder, C.**, "Effective time step restrictions for explicit MPM simulation," ACM SIGGRAPH/Eurographics Symposium on Computer Animation (SCA), (2020).
- Ding, O., **Schroeder, C.** "Cached Gaussian elimination for simulating Stokes flow on domains with repetitive geometry," Journal of Computational Physics, 423, (2020).
- Ding, O., Shinar, T., **Schroeder, C.** "Affine particle in cell method for MAC grids and fluid simulation," Journal of Computational Physics, 408, (2020).
- Ding, O., **Schroeder, C.**, "Penalty Force for Coupling Materials with Coulomb Friction," IEEE Transactions on Visualization and Computer Graphics, 26 (7), 2443-2455 (2020).
- Jiang, C., **Schroeder, C.**, Teran, J. "An angular momentum conserving affine-particle-in-cell method," *Journal of Computational Physics*, 338, 137-164 (2017).
- Klár, G., Gast, T., Pradhana, A., Fu, C., **Schroeder, C.**, Jiang, C., Teran, J. "Drucker-Prager Elastoplasticity for Sand Animation," *SIGGRAPH 2016*, ACM Transactions on Graphics (SIGGRAPH 2016).
- Jiang, C., **Schroeder, C.**, Selle, A., Teran, J., Stomakhin, A. "The Affine Particle-In-Cell Method," *SIGGRAPH 2015*, ACM Transactions on Graphics (SIGGRAPH 2015), 34(4), pp. 51:1–51:10, (2015).
- Ram, D., Gast, T., Jiang, C., **Schroeder, C.**, Stomakhin, A., Teran, J., Kavehpour, P. "A Material Point Method for Viscoelastic Fluids, Foams and Sponges," *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 157–163, (2015).
- Gast, T., **Schroeder, C.**, Stomakhin, A., Jiang, C., Teran, J. "Optimization Integrator for Large Time Steps," *IEEE Transactions on Visualization and Computer Graphics*, 21(10), 1103-1115 (2015).

- Stomakhin, A., **Schroeder, C.**, Jiang, C., Chai, L., Teran, J., Selle, A. "Augmented MPM for phase-change and varied materials," *SIGGRAPH 2014*, ACM Transactions on Graphics (SIGGRAPH 2014), 33(4), pp. 138:1-138:11, (2014).
- Gast, T., **Schroeder, C.** "Optimization Integrator for Large Time Steps," *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 31-40, (2014). Awarded best paper honorable mention.
- Wang, Y., Jiang, C., **Schroeder, C.**, Teran, J. "An Adaptive Virtual Node Algorithm with Robust Mesh Cutting," *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 77-85, (2014).
- **Schroeder, C.**, Stomakhin, A., Howes, R., Teran, J. "A Second Order Virtual Node Algorithm for Navier Stokes Flow Problems with Interfacial Forces and Discontinuous Material Properties." *Journal of Computational Physics*, 265, 221-245 (2014).
- Hegemann, J., Jiang, C., **Schroeder, C.**, Teran, J. "A Level Set Method for Ductile Fracture." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 193-201, (2013). Awarded best paper.
- Stomakhin, A., **Schroeder, C.**, Chai, L., Teran, J., Selle, A. "A material point method for snow simulation." *SIGGRAPH 2013*, ACM Transactions on Graphics (SIGGRAPH 2013), 32(4), pp. 102:1-102:10, (2013).
- Howes, R., **Schroeder, C.**, Teran, J. "A Virtual Node Algorithm for Hodge Decomposition Problems with Irregular Domains." *Methods and Applications of Analysis*, 200(4), 439-455 (2013).
- Stomakhin, A., Howes, R., **Schroeder, C.**, Teran, J. "Energetically Consistent Invertible Elasticity." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, pp. 25-32, (2012).
- **Schroeder, C.**, Zheng, W., Fedkiw, R. "Implicit Surface Tension Formulation with a Lagrangian Surface mesh on an Eulerian Simulation Grid." *Journal of Computational Physics*, 231, 2092-2115 (2012).
- **Schroeder, C.**, Kwatra, N., Zheng, W. and Fedkiw, R. "Asynchronous Evolution for Fully-Implicit and Semi-Implicit Time Integration." *Pacific Graphics 2011*, 30, 1983-1992 (2011).
- Robinson-Mosher, A., **Schroeder, C.**, Fedkiw, R. "A symmetric positive definite formulation for monolithic fluid structure interaction." *Journal of Computational Physics*, 230, 1547-1566 (2011).
- Lentine, M., Grfarsson, J., **Schroeder, C.**, Robinson-Mosher, A., Fedkiw, R. "Creature Control in a Fluid Environment." *IEEE Transactions on Visualization and Computer Graphics*, 17, 682-693 (2011).

- Su, J., **Schroeder, C.**, Fedkiw, R. "Energy Stability and Fracture for Frame Rate Rigid Body Simulations." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, edited by Eitan Grinspun and Jessica Hodgins, pp. 155-164 (2009).
- Shinar, T., **Schroeder, C.**, Fedkiw, R. "Two-way Coupling of Rigid and Deformable Bodies." *ACM SIGGRAPH/Eurographics Symposium on Computer Animation*, edited by Doug James and Markus Gross, pp. 95-103 (2008).
- Irving, G., **Schroeder, C.**, Fedkiw, R. "Volume Conserving Finite Element Simulations of Deformable Models." *SIGGRAPH 2007*, ACM Transactions on Graphics (SIGGRAPH 2013), 26(3), pp. 13.1-13.6, (2007)
- **Schroeder, C.**, Breen, D., Cera, C., Regli, W.. "Stochastic Microgeometry for Displacement Mapping." *Shape Modeling International 2005*, MIT, Cambridge, 15-17 July 2005.
- **Schroeder, C.**, Regli, W., Shokoufandeh, A., Sun, W. "Computer-Aided Design of Porous Artifacts." *Journal of Computer-Aided Design*, Sept 2004, Vol. 36.
- **Schroeder, C.**, Regli, W., Shokoufandeh, A., Sun, W.. "Representation of Porous Artifacts for Bio-Medical Applications." *8th ACM Symposium on Solid Modeling and Applications*, 2002, Seattle, Washington, 16 Jun 2003.

Courses

- SIGGRAPH 2022: "Practical course on computing derivatives in code"
- SIGGRAPH 2019: "Practical course on computing derivatives in code"
- SIGGRAPH 2016: "The material point method for simulating continuum materials"
- SIGGRAPH 2011: "PhysBAM: Physically based simulation"

Program Committees

- **ACM SIGGRAPH Technical Papers** *2016*
- **ACM Symposium on Computer Animation** *2016, 2017, 2020, 2021, 2022*
- **Computer Animation and Social Agents** *2017, 2019, 2020, 2021, 2022*
- **Pacific Graphics** *2020, 2021, 2022*

Professional Service

- **ACM Symposium on Computer Animation, Co-Chair** *2019*
- **Journal Computer Animation and Virtual Worlds, Associate Editor** *2017-Present*
- **SIGGRAPH Press Release Coordinator** *2022*

Teaching Experience

- **Assistant Professor**
  University of California Riverside, Department of Computer Science & Engineering
  - Computer Graphics *Summer 2022*
  - Project in Computer Science *Spring 2022*
  - Computer Graphics (grad) *Winter 2022*
  - Computer Graphics *Fall 2021*
  - Project in Computer Science *Spring 2021*
  - Software Construction *Winter 2021*
  - Computer Graphics *Fall 2020*
  - Computer Animation (grad) *Spring 2020*
  - Computer Graphics (grad) *Winter 2020*
  - Computer Graphics *Fall 2019*
  - Project in Computer Science *Spring 2019*
  - Computer Graphics (grad) *Winter 2019*
  - Seminar in Computer Science (grad) *Fall 2018*
  - Computer Graphics *Fall 2018*
  - Project in Computer Science *Spring 2018*
  - Computer Graphics (grad) *Winter 2018*
  - Computer Graphics (grad) *Summer 2017*
  - Computer Graphics (grad) *Winter 2017*
  - Computer Graphics *Fall 2016*
- **Assistant Adjunct Professor**
  University of California Los Angeles, Department of Mathematics

- Ordinary Differential Equations *Spring 2016*
- Mathematical Modelling *Winter 2016*
- Mathematical Modelling *Fall 2015*
- Mathematical Modelling *Spring 2015*
- Calculus of several variables *Winter 2015*
- Integration and Infinite Series *Fall 2014*
- Mathematical Modelling *Spring 2014*

♦ **RIPS Program Academic Mentor** *Summer 2014*
University of California Los Angeles, Department of Mathematics

♦ **RIPS Program Academic Mentor** *Summer 2011*
University of California Los Angeles, Department of Mathematics

♦ **Course Assistant**
Stanford University, Department of Computer Science

- Math and Computer Science behind Special Effects *Spring 2011*
- Mathematical Methods for Fluids, Solids and Interfaces *Spring 2009*
- Mathematical Methods for Fluids, Solids and Interfaces *Spring 2008*
- Mathematical Methods for Fluids, Solids and Interfaces *Spring 2007*

♦ **Course Assistant**
Drexel University, Department of Computer Science

- Computer Graphics I *Winter 2004*

Student Supervision

♦ Current

- ♦ Jason Goulding, PhD
- ♦ Mehrnaz Ayazi, PhD
- ♦ Chen Zhao, PhD
- ♦ Song Bai, PhD

♦ Past

- ♦ Lei Zhang, MS, 2021
- ♦ Dekang Zeng, MS, 2021
- ♦ Zhenyu Yang, MS, 2021
- ♦ Xinlong Li, MS, 2021
- ♦ Chunhan Zhang, MS, 2021

- Song Bai, MS, 2020
- Ounan Ding, PhD, 2019

- High school and undergraduate
  - Ritoban Roy Chowdhury
  - Rachel Lau
  - Diane Ngo
  - Reuben D'Cunha
  - Jason Sadler
  - Jennifer Lee
  - Brandon Yi
  - Ryan Quach
  - Chandler Bottomly
  - Jiunn Siow

Talks

- **ACM SIGGRAPH Conference Course Presenter (virtual)** *August 2022*
  Vancouver, Canada
  Title: Practical course on computing derivatives in code
- **ACM SIGGRAPH Conference Course Presenter** *August 2019*
  Los Angeles, CA
  Title: Practical course on computing derivatives in code
- **MPM10 Workshop Lawrence Livermore National Laboratory** *September 2017*
  Livermore, CA
  A new Particle-In-Cell technique for reducing noise
- **14th U.S. National Congress on Computational Mechanics...** *July 2017*
  Montreal, Canada
  A new Particle-In-Cell technique for reducing noise
- **Department Colloquium** *February 2015*
  University of California Riverside
  Title: Hybrid simulation methods: simulating the world around you
- **Department Colloquium** *February 2015*
  Clemson University
  Title: Hybrid simulation methods: simulating the world around you
- **Department Colloquium** *January 2015*
  Georgia Institute of Technology
  Title: Hybrid simulation methods: simulating the world around you

- **ACM SIGGRAPH Conference Presenter** *August 2015*
  Los Angeles, California
  Title: Affine Particle In Cell
- **Walt Disney Animation Studios** *July 2015*
  Burbank, California
  Title: Affine Particle In Cell
- **Department Colloquium** *February 2015*
  University of Utah
  Title: Tackling the robustness problem in physically-based simulation
- **Department Colloquium** *January 2015*
  University of Houston
  Title: Tackling the robustness problem in physically-based simulation
- **Department Colloquium** *November 2014*
  University of Wisconsin-Madison
  Title: Tackling the robustness problem in physically-based simulation
- **Department Colloquium** *October 2014*
  University of California San Diego
  Title: Robustness in physically-based simulation for computer graphics
- **Symposium on Computer Animation Conference Presenter** *July 2014*
  Copenhagen, Denmark
  Title: An Adaptive Virtual Node Algorithm with Robust Mesh Cutting
- **8th Southern California Symposium on Flow Physics** *April 2014*
  University of California Los Angeles
  Title: Second Order Interfacial Navier-Stokes
- **Department Colloquium** *November 2013*
  University of California Los Angeles
  Title: Second Order Interfacial Navier-Stokes
- **Department Colloquium** *May 2013*
  University of California Los Angeles
  Title: Implicit Surface Tension
- **Department Colloquium** *February 2013*
  University of California Los Angeles
  Title: Energetically Consistent Invertible Elasticity
- **Symposium on Computer Animation Conference Presenter** *July 2012*
  Lausanne, Switzerland
  Title: Energetically Consistent Invertible Elasticity
- **Department Colloquium** *February 2012*
  University of California Los Angeles

Title: Implicit Surface Tension

- **Pacific Graphics Conference Presenter** *September 2011*
  Kaohsiung, Taiwan
  Title: Asynchronous Evolution for Fully-Implicit and Semi-Implicit Time Integration
- **ACM SIGGRAPH Conference Course Presenter** *August 2011*
  Vancouver, Canada
  Title: PhysBAM: Physically Based Simulation
- **Symposium on Computer Animation Conference Presenter** *July 2008*
  Dublin, Ireland
  Title: Two-way coupling of rigid and deformable bodies

Screen credits

- **"Up"** *May 2009*
  Pixar Animation Studios
- **"Frozen"** *November 2013*
  Walt Disney Animation Studios

Honors

- **Best Paper Honorable Mention** *October 2020*
  ACM SIGGRAPH/Eurographics Symposium on Computer Animation
- **Best Paper Honorable Mention** *July 2014*
  ACM SIGGRAPH/Eurographics Symposium on Computer Animation
- **Best Paper** *July 2013*
  ACM SIGGRAPH/Eurographics Symposium on Computer Animation
- **Film Credit in Disney's "Frozen"** *2013*
  Walt Disney Animation Studios
- **2013 Chancellor's Award for Postdoctoral Research** *May 2013*
  University of California Los Angeles
- **Film Credit in Pixar's "Up"** *2009*
  Pixar Animation Studios
- **Sequoia Capital Fellowship** *September 2008*
  Stanford Graduate Fellowship
- **National Science Foundation Honorable Mention** *April 2006*
  National Science Foundation
- **Summer Undergraduate Research Fellowship** *June 2005*
  National Institute of Standards and Technology
- **A* Scholarship Award** *February 2005*
  11th Annual Engineers Week
  Honors Day Awards Ceremony

- **Research Day 2004 Winner** *May 2004*
  Sixth Annual Research Day at Drexel University
  Winner in the area of Basic/Applied Science: Undergraduate student
- **Alvin W. Wene Engineering Scholarship** *February 2004*
  10th Annual Engineers Week
  Honors Day Awards Ceremony
- **International Science Fair Scholarship** *May 2000*
  Full-Tuition Scholarship for 5 years at Drexel University
  2000 Intel International Science and Engineering Fair