

Breannan Smith

Meta

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Education

- Ph.D., Computer Science, Columbia University, May 2018.
Thesis: *Structure Preserving and Scalable Simulation of Colliding Systems*
Advisor: Eitan Grinspun
- M.Phil., Computer Science, Columbia University, May 2012.
- M.S., Computer Science, Columbia University, May 2009.
Cumulative GPA: 4.11
- B.S., Computer Science, University of North Carolina at Chapel Hill, with highest distinction and honors, December 2007.
Minors: Physics and Mathematics
Dean's List: Fall 2005 – Fall 2007
Cumulative GPA: 3.95, Computer Science GPA: 4.0
Thesis: *Stress Filtering in Sheared Viscoelastic Layers and Hypotheses for Biological Relevance*
Advisor: M. Gregory Forest
- North Carolina State University (Physics and Computer Science), Fall 2003 – Spring 2005.
Dean's List: Fall 2003 – Spring 2005
Cumulative GPA: 4.0

Research Interests

- Computer graphics, computational models for physical simulation and computer animation, computational contact and impact mechanics, nonlinear optimization.

Honors and Awards

Scholarship and Research

- Conference on Modeling Granular Media Across Scales Junior Researcher Award (2014)
- NVIDIA Graduate Fellowship Finalist (2013)
- Columbia University Presidential Fellowship (Fall 2008 – Spring 2013)
- National Defense Science and Engineering Graduate (NDSEG) Fellowship (Fall 2008 – Summer 2011)
- Integrated Biomedical Research Training Program (IBRTP) NIH Undergraduate Research Fellowship (Spring 2007 – Fall 2007)
- Phi Beta Kappa (inducted Fall 2006)
- Golden Key Honor Society (inducted Fall 2005)
- Sigma Pi Sigma Physics Honor Society (inducted Fall 2004)

University Service

- Columbia University Computer Science Service Award, 2010, 2011, 2012, 2013, and 2014
Awarded for exemplary service in my role as student coordinator for the department's annual Ph.D. recruitment visit, including my contributions to general Ph.D. recruitment efforts.
- Columbia University Computer Science Andrew P. Kosoresow Memorial Award for Excellence in Teaching and Service, 2011
Awarded for both my work in developing new and innovative curriculum and course materials for COMS 4167, and for my role as student coordinator for the department's annual Ph.D. recruitment visit.

Professional Service

- Paper Reviewer, SIGGRAPH 2023
- Paper Reviewer, SIGGRAPH Asia 2022
- Paper Committee, SCA 2022
- Paper Reviewer, SIGGRAPH 2022
- Program Committee, SCA 2021
- Paper Reviewer, SIGGRAPH Asia 2021
- Paper Reviewer, SIGGRAPH 2021
- Paper Reviewer, SIGGRAPH Asia 2020
- Paper Reviewer, SIGGRAPH 2020
- Paper Reviewer, SIGGRAPH Asia 2019
- Program Committee, SCA 2019
- Paper Reviewer, SIGGRAPH 2019
- Paper Reviewer, SIGGRAPH Asia 2018
- Paper Reviewer, SIGGRAPH 2018
- Paper Reviewer, SIGGRAPH Asia 2017
- Paper Reviewer, SIGGRAPH 2017
- Paper Reviewer, Eurographics 2017
- Paper Reviewer, SIGGRAPH Asia 2016
- Paper Reviewer, SIGGRAPH 2016
- Paper Reviewer, Eurographics 2016
- Emerging Technologies Reviewer, SIGGRAPH Asia 2015
- Paper Reviewer, Graphics Interface 2015
- Paper Reviewer, SIGGRAPH Asia 2014
- Paper Reviewer, Eurographics 2014
- Paper Reviewer, SIGGRAPH 2013
- Paper Reviewer, CAD/Graphics 2013
- Paper Reviewer, SIGGRAPH 2012
- Paper Reviewer, ACM Transactions on Graphics
- Paper Reviewer, ASME Journal of Computational and Nonlinear Dynamics
- Paper Reviewer, Computer Animation and Virtual Worlds (CAVW)
- Paper Reviewer, Computer Graphics Forum
- Paper Reviewer, IEEE Transactions on Haptics
- Paper Reviewer, IEEE Transactions on Visualization and Computer Graphics (TVCG)
- Paper Reviewer, IEEE Access
- Paper Reviewer, Journal of Computational Physics
- Paper Reviewer, The Visual Computer

Teaching Experience

- Fall 2010: **Teaching Assistant** (COMS 4167: Physically Based Computer Animation)
Columbia University, Department of Computer Science
Designed and implemented an ‘instant-feedback’ grading system tailored to Computer Science students for numerical simulation programming. Prepared new course materials and course notes; presented lectures; and held office hours.
- Spring 2010: **Teaching Assistant** (COMS 4167: Physically Based Computer Animation)
Columbia University, Department of Computer Science
Presented lectures on collision detection/computational geometry, cloth simulation, and hair simulation; prepared and graded theory and programming assignments; held office hours.
- Spring 2007: **Teaching Assistant** (Physics 352: Electronics II)
University of North Carolina at Chapel Hill, Department of Physics
Led and taught an undergraduate lab section; prepared and troubleshot labs; graded lab reports.

- Fall 2006: **Teaching Assistant** (Physics 351: Electronics I)
University of North Carolina at Chapel Hill, Department of Physics
Led and taught an undergraduate lab section; prepared and troubleshot labs; graded lab reports; invited guest lecturer on phasors in circuit analysis.

Research Experience

- December 2018 – Present: Research Scientist
Meta, Reality Labs, Redmond, Washington
- June 2016 – November 2018: Postdoctoral Research Scientist
Pixar Animation Studios, Emeryville, California
Developed a novel model for robust and volume-preserving simulations of character flesh; developed a general theory that reveals the analytical eigensystem of any isotropic hyperelastic material; deployed volumetric simulation models to open-source and in-house simulation systems; deployed volumetric simulations as components of live character rigs in Pixar's Presto animation software.
- Summer 2012: Research and Development Intern
Weta Digital, Wellington, New Zealand
Developed a highly parallel system for computing static configurations of large hair assemblies in the presence of volumetric interaction forces.
- Summer 2009: Advanced Technology Labs Intern
Adobe Systems Incorporated, San Jose, CA
Explored numerical methods for the real-time simulation of viscoelastic fluids.
- Spring 2007 – Summer 2008: NIH Undergraduate Research Fellow
University of North Carolina at Chapel Hill, Department of Applied Mathematics
Worked with Professor M. Gregory Forest and his research team on the modeling of nonlinear-viscoelastic fluids and biologically-relevant applications; developed numerical simulation software; mentored an undergraduate student working with the team during summer 2007.

Publications

- Donglai Xiang, Timur Bagautdinov, Tuur Stuyck, Fabian Prada, Javier Romero, Weipeng Xu, Shunsuke Saito, Jingfan Guo, **Breannan Smith**, Takaaki Shiratori, Yaser Sheikh, Jessica Hodgins, and Chenglei Wu. 2022. "Dressing Avatars: Deep Photorealistic Appearance for Physically Simulated Clothing." *ACM Transactions on Graphics* 41, 6, (December), 222:1-222:15.
- Qingyang Tan, Zherong Pan, **Breannan Smith**, Takaaki Shiratori, and Dinesh Manocha. "N-Penetrate: Active Learning of Neural Collision Handler for Complex 3D Mesh Deformations." 2022. *International Conference on Machine Learning* 162:21037-162:21049.
- **Breannan Smith**, Chenglei Wu, He Wen, Patrick Peluse, Yaser Sheikh, Jessica K. Hodgins, and Takaaki Shiratori. 2020. "Constraining Dense Hand Surface Tracking with Elasticity." *ACM Transactions on Graphics* 39, 6, (December), 219:1-219:14.
- **Breannan Smith**, Fernando de Goes, and Theodore Kim. 2019. "Analytic Eigensystems for Isotropic Distortion Energies." *ACM Transactions on Graphics* 38, 1, (February), 3:1-3:15.
- Yonghao Yue*, **Breannan Smith***, Maytee Chantharayukhonthorn*, Peter Yichen Chen*, Ken Kamrin, and Eitan Grinspun. 2018. "Hybrid Grains." *ACM Transactions on Graphics* 32, 6, (November), 283:1-283:19. *Co-first authors: authors contributed equally.
- **Breannan Smith**, Fernando de Goes, and Theodore Kim. 2018. "Stable Neo-Hookean Flesh Simulation." *ACM Transactions on Graphics* 37, 2, (March), 12:1-12:15.
- Etienne Vouga, **Breannan Smith**, Danny M. Kaufman, Rasmus Tamstorf, and Eitan Grinspun. 2017. "All's Well That Ends Well: Guaranteed Resolution of Simultaneous Rigid-Body Impact." *ACM Transactions on Graphics* 36, 4, (July), 151:1-151:19.

- Yonghao Yue, **Breannan Smith**, Christopher Batty, Changxi Zheng, and Eitan Grinspun. 2015. “Continuum Foam: A Material Point Method for Shear-Dependent Flows.” *ACM Transactions on Graphics* 34, 5 (November), 160:1-160:20.
- Danny M. Kaufman, Rasmus Tamstorf, **Breannan Smith**, Jean-Marie Aubry, and Eitan Grinspun. 2014. “Adaptive Nonlinearity for Collisions in Complex Rod Assemblies.” *ACM Transactions on Graphics* 33, 4 (July), 123:1-123:12.
- **Breannan Smith**, Danny M. Kaufman, Etienne Vouga, Rasmus Tamstorf, and Eitan Grinspun. 2012. “Reflections on simultaneous impact.” *ACM Transactions on Graphics* 31, 4 (July), 106:1-106:12.
- David Harmon, Etienne Vouga, **Breannan Smith**, Rasmus Tamstorf, and Eitan Grinspun. 2012. “Asynchronous contact mechanics.” *Communications of the ACM* (April), 102-109.
- Brandon S. Lindley, M. Gregory Forest, **Breannan D. Smith**, Sorin M. Mitran, and David B. Hill. 2012. “Spatial stress and strain distributions of viscoelastic layers in oscillatory shear.” *Mathematics and Computers in Simulation* 82, 7, 1249-1257.
- David Harmon, Etienne Vouga, **Breannan Smith**, Rasmus Tamstorf, and Eitan Grinspun. 2009. “Asynchronous contact mechanics.” *ACM Transactions on Graphics* 28, 3 (July), 87:1-87:12.
- Brandon Lindley, Eddie Lee Howell, **Breannan D. Smith**, Gregory J. Rubinstein, M. Gregory Forest, Sorin M. Mitran, David B. Hill, and Richard Superfine. 2009. “Stress communication and filtering of viscoelastic layers in oscillatory shear.” *Journal of Non-Newtonian Fluid Mechanics* 156, 1, 112-120.

Lectures

- **Breannan Smith**. “*Constraining Dense Hand Surface Tracking with Elasticity*.” Presentation at SIGGRAPH Asia 2020, Daegu, South Korea (Virtual), December 2020.
- **Breannan Smith**. “*Analytic Eigensystems for Isotropic Distortion Energies*.” Presentation at SIGGRAPH 2019, Los Angeles, California, July 2019.
- **Breannan Smith**. “*Grains, Manes, and Brawn*.” Presentation at Facebook Reality Labs, Pittsburgh, Pennsylvania, September 2018.
- **Breannan Smith**. “*Stable Neo-Hookean Flesh Simulation*.” Presentation at SIGGRAPH 2018, Vancouver, British Columbia, August 2018.
- **Breannan Smith**. “*Grains, Manes, and Shaving Cream: Modeling Virtual Motion*.” Presentation at Disney Research Zürich, Zürich, Switzerland, May 2015.
- **Breannan Smith**. “*Reflections on Simultaneous Impact*.” Presentation at Modeling Granular Media Across Scales 2014, Montpellier, France, July 2014. Recipient of the “Junior Researcher Prize.”
- **Breannan Smith**. “*Collision Response Algorithms for Rigid and Deformable Bodies*.” Presentation at The Institute of Science and Technology Austria, Klosterneuburg, Austria, June 2014.
- **Breannan Smith**. “*Reflections on Simultaneous Impact*.” Presentation at Computational Contact Mechanics: Advances and Frontiers in Modeling Contact, Banff International Research Station, Banff, Alberta, Canada, February 2014.
- **Breannan Smith**. “*Reflections on Simultaneous Impact*.” Presentation at the New England Workshop on the Mechanics of Materials and Structures, Brown University, Providence, Rhode Island, November, 2012.
- **Breannan Smith**. “*Generalized Reflections for Impact Resolution*.” Presentation at the Bellairs Workshop on Computer Animation, Holetown, Barbados, February 2011.
- **Breannan Smith**. “*Reverse Hairdo*.” Presentation at the Bellairs Workshop on Computer Animation, Holetown, Barbados, February 2010.

Film Credits

- *Incredibles 2*. Research. Directed by Brad Bird. 2018; Pixar Animation Studios.
- *Coco*. Research. Directed by Lee Unkrich and Adrian Molina. 2017; Pixar Animation Studios.
- *Dawn of the Planet of the Apes*. Production Engineering & Research & Development. Directed by Matt Reeves. 2014; Chernin Entertainment and TSG Entertainment.
- *The Hobbit: An Unexpected Journey*. Research & Development. Directed by Peter Jackson. 2012; New Line Cinema and Metro-Goldwyn-Mayer (MGM).

Poster Presentations

- **Breannan Smith.** “*Stress Communication in Sheared Viscoelastic Layers: Selection Mechanisms and Redundancy.*” Presentation at the Southeastern Atlantic Mathematical Sciences Workshop (Cha-Cha Days), National Institute of Aerospace. Hampton, VA, October 2007.

Foreign Language Proficiency

- German: Proficient reading and writing
Excellent conversational German