

ISHAN SRIVASTAVA

Lawrence Berkeley National Laboratory
Applied Mathematics Department
MS 50A-3111, 1 Cyclotron Road, Berkeley, CA 94720

email: isriva@lbl.gov
website: <https://ccse.lbl.gov/people/isriva>

EDUCATION

Purdue University Ph.D. in Mechanical Engineering, 2017

Dissertation: *Rheology, Mechanics and Transport in Granular Materials:*

A Versatile Computational Framework

Advisor: Prof. Timothy S. Fisher

Birla Institute of Technology and Science, Pilani B.E. (Hons.) in Mechanical Engineering, 2009

EXPERIENCE

Lawrence Berkeley National Laboratory. June 2022 - present

Research Scientist, Applied Mathematics Department

Lawrence Berkeley National Laboratory. July 2020 - June 2022

Postdoctoral Scholar, Applied Mathematics Department

Supervisor: Dr. John B. Bell

Sandia National Laboratories. April 2017 - July 2020

Postdoctoral Researcher, Center for Integrated Nanotechnologies

Supervisor: Dr. Gary S. Grest

Purdue University. August 2011 - May 2017

Graduate Research Assistant, Department of Mechanical Engineering

Supervisor: Prof. Timothy S. Fisher

Hindustan Aeronautics Limited, Bangalore. August 2009 - May 2010

Design Engineer, Aircraft R&D Centre

PUBLICATIONS

Journal Articles

21. J. M. Monti, I. Srivastava, L. E. Silbert, J. B. Lechman, G. S. Grest, *Fractal Dimensions of Jammed Packings with Power-Law Particle Size Distributions in Two and Three Dimensions*, **Phys. Rev. E** (in press), 2023.
20. J. G. Wang, D. R. Ladiges, I. Srivastava, S. P. Carney, A. J. Nonaka, A. L. Garcia, J. B. Bell, *Steric Effects in Induced-Charge Electro-Osmosis for Strong Electric Fields*, **Phys. Rev. Fluids**, 8, 083702, 2023.
19. I. Srivastava, D. R. Ladiges, A. Nonaka, A. L. Garcia, J. B. Bell, *Staggered Scheme for the Compressible Fluctuating Hydrodynamics of Multispecies Fluid Mixtures*, **Phys. Rev. E** (editor's suggestion), 107, 015305, 2023.
18. D. R. Ladiges, J. G. Wang, I. Srivastava, S. P. Carney, A. Nonaka, A. L. Garcia, A. Donev, J. B. Bell, *Modeling Electrokinetic Flows with the Discrete Ion Stochastic Continuum Overdamped Solvent Algorithm*, **Phys. Rev. E**, 106, 035104, 2022.

¹Updated October 10, 2023

17. J. M. Monti, J. T. Clemmer, I. Srivastava, L. E. Silbert, J. B. Lechman, G. S. Grest, *Large-Scale Frictionless Jamming with Power-Law Particle Size Distributions*, **Phys. Rev. E**, 106, 034901, 2022.
16. A. P. Santos, I. Srivastava, L. E. Silbert, J. B. Lechman, G. S. Grest, *Fluctuations and Power-Law Scaling of Dry, Frictionless Granular Rheology near the Hard-Particle Limit*, **Phys. Rev. Fluids**, 7, 084303, 2022.
15. I. Srivastava, L. E. Silbert, J. B. Lechman, G. S. Grest, *Flow and Arrest in Stressed Granular Materials*, **Soft Matter (cover article)**, 18, 735, 2022.
14. W. D. Fullmer, R. Porcu, J. Musser, A. S. Almgren, I. Srivastava, *The Divergence of Nearby Trajectories in Soft-Sphere DEM*, **Particuology (cover article)**, 63, 1, 2022.
13. J. T. Clemmer, I. Srivastava, G. S. Grest, J. B. Lechman, *Shear is Not Always Simple: Rate-Dependent Effects of Loading Geometry on Granular Rheology*, **Phys. Rev. Lett.**, 127, 268003, 2021.
12. I. Srivastava, S. A. Roberts, J. T. Clemmer, L. E. Silbert, J. B. Lechman, G. S. Grest, *Jamming of Bidisperse Frictional Spheres*, **Phys. Rev. Research**, 3(3), L032042, 2021.
11. I. Srivastava, L. E. Silbert, G. S. Grest, J. B. Lechman, *Viscometric Flow of Dense Granular Materials under Controlled Pressure and Shear Stress*, **J. Fluid Mech.**, 907(A18), 1, 2021.
10. A. P. Santos, D. S. Bolintineanu, G. S. Grest, J. B. Lechman, S. J. Plimpton, I. Srivastava, L. E. Silbert, *Granular Packings with Sliding, Rolling and Twisting Friction*, **Phys. Rev. E**, 102, 032903, 2020.
9. I. Srivastava, D. S. Bolintineanu, J. B. Lechman, S. A. Roberts, *Controlling Binder Adhesion to Impact Electrode Mesosstructure and Transport*, **ACS Appl. Mater. Interfaces (cover article)**, 12, 34919, 2020.
8. I. Srivastava, J. B. Lechman, G. S. Grest, L. E. Silbert, *Evolution of Internal Granular Structure at the Flow-Arrest Transition*, **Granul. Matt. (invited article)**, 22(2), 1, 2020.
7. I. Srivastava, L. E. Silbert, G. S. Grest, J. B. Lechman, *Flow-Arrest Transitions in Frictional Granular Matter*, **Phys. Rev. Lett.**, 122(4), 048003, 2019.
6. I. Srivastava, B. L. Peters, J. M. D. Lane, H. Fan, K. M. Salerno, G. S. Grest, *Mechanics of Gold Nanoparticle Superlattices at High Hydrostatic Pressures*, **J. Phys. Chem. C**, 123(28), 17530, 2019.
5. K. M. Salerno, D. S. Bolintineanu, G. S. Grest, J. B. Lechman, S. J. Plimpton, I. Srivastava, L. E. Silbert, *Effect of Shape and Friction on the Packing and Flow of Granular Materials*, **Phys. Rev. E**, 98(5), 050901, 2018.
4. I. Srivastava, T. S. Fisher, *Slow Creep in Soft Granular Packings*, **Soft Matter**, 13(18), 3411, 2017.
3. L. Y. Leung, C. Mao, I. Srivastava, P. Du, C. Y. Yang, *Flow Function of Pharmaceutical Powders Is Predominantly Governed by Cohesion, Not by Friction Coefficients*, **J. Pharm. Sci.**, 106(7), 1865, 2017.
2. K. C. Smith, I. Srivastava, T. S. Fisher, M. Alam, *Variable-Cell Method for Stress-Controlled Jamming of Athermal, Frictionless Grains*, **Phys. Rev. E**, 89(4), 042203, 2014.
1. I. Srivastava, S. Sadasivam, K. C. Smith, T. S. Fisher, *Combined Microstructure and Heat Conduction Modeling of Heterogeneous Interfaces and Materials*, **J. Heat Transfer**, 135(6), 061603, 2013.

Peer-Reviewed Conference Proceedings

4. J. M. D. Lane, A. P. Thompson, I. Srivastava, G. S. Grest, T. Ao, B. Stoltzfus, K. Austin, H. Fan, D. Morgan, M. D. Knudson, *Scale and Rate in CdS Pressure-Induced Phase Transition*, Shock Compression of Condensed Matter 2019, 2272(1), 100016, 2020.
3. J. M. D. Lane, K. M. Salerno, I. Srivastava, G. S. Grest, H. Fan, *Modeling Pressure-Driven Assembly of Polymer Coated Nanoparticles*, Shock Compression of Condensed Matter 2017, 1979(1), 090007, 2018.
2. R. Kantharaj, I. Srivastava, K. R. Thaker, A. U. Gaitonde, A. Bruce, J. Howarter, T. S. Fisher, A. M. Marconnet, *Thermal Conduction in Graphite Flake-Epoxy Composites using Infrared Microscopy*, Proceedings of the 16th IEEE Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems, 1-7, 2017.
1. I. Srivastava, K. C. Smith, T. S. Fisher, *Shear-Induced Failure in Jammed Nanoparticle Assemblies*, Powders and Grains 2013, 1542(1), 86, 2013.

PRESENTATIONS

Invited

17. *How Do Granular Materials Deform and Flow: From Particle to Continuum*. LBNL CS Area Summer Program, Berkeley, CA, July 2023.
16. *Upscaling Particle-Scale Simulations towards Continuum Modeling of Dense Granular Materials*. Department of Physics, University of Amsterdam, Amsterdam, Netherlands, February 2023.
15. *Upscaling Particle-Scale Simulations towards Continuum Modeling of Dense Granular Materials*. SIAM Conference on Computational Science and Engineering, Amsterdam, Netherlands, February 2023.
14. *Modeling Flow-Arrest Transitions in Dense Granular Materials: From Particle to Continuum*. Department of Physics, Naval Postgraduate School, Monterey, CA, January 2023.
13. *Upscaling Particle-Scale Simulations towards Continuum Modeling of Dense Granular Materials*. 2022 Annual Technical Meeting of the Society of Engineering Science, College Station, TX, October 2022.
12. *Modeling hydrodynamic fluctuations in non-equilibrium gas mixtures during effusion*. Courant Institute of Mathematical Sciences, NYU, NY (virtual), November 2021.
11. *Boundary implementation in the immersed boundary modeling of discrete-ion electrolytes*. SIAM Conference on Computational Science and Engineering, (virtual), March 2021.
10. *Continuum rheological modeling of complex granular materials in complex flow scenarios*. APS Annual March Meeting, (virtual), March 2021.
9. *Generalized constitutive modeling of granular materials near the flow-arrest transition*. Department of Mechanical Engineering, Indian Institute of Technology, Kanpur, India (virtual), December 2020.
8. *Continuum rheology of granular materials at the flow-arrest transition*. 2020 Annual Technical Meeting of the Society of Engineering Science, (virtual), September 2020.
7. *Flow-arrest transition in (frictional) granular materials*. Department of Physics, San Jose State University, San Jose, CA (virtual), September 2020.
6. *Flow-arrest transition in granular materials*. Computational Research Division, Lawrence Berkeley National Laboratory, Berkeley, CA (virtual), March 2020.
5. *Statistics and rheology at the flow-arrest transition in frictional granular matter*. U.S. DOE Center for Integrated Nanotechnologies Annual User Meeting, Santa Fe, NM, September 2019.

4. *Statistics and rheology at the flow-arrest transition in frictional granular matter*. 4th International Conference on Packings, Yale University, New Haven, CT, June 2019.
3. *Flow-arrest transitions in frictional granular matter*. Los Alamos National Laboratory, Los Alamos, NM, October 2018.
2. *Mechanics, rheology and transport in granular solids*. Sandia National Laboratories, Albuquerque, NM, November 2016.
1. *Mechanics, rheology and transport in granular solids*. Department of Mechanical Science and Engineering, University of Illinois Urbana-Champaign, Urbana, IL, April 2016.

Selected Contributed

17. *A Robust Numerical Scheme for Fluctuating Hydrodynamics of Multispecies Gas Mixtures*. DSMC 2023 Conference, Santa Fe, NM, September 2023.
16. *Upscaling Particle-Scale Simulations towards Continuum Modeling of Dense Granular Materials*. APS Annual March Meeting, Las Vegas, NV, March 2023.
15. *Non-equilibrium hydrodynamic fluctuations in binary fluids during effusion*. APS Annual March Meeting, Chicago, IL, March 2022.
14. *Mesoscale hydrodynamic fluctuations in nonequilibrium gas mixtures across a transpiration membrane*. APS Division of Fluid Dynamics Annual Meeting, (virtual), November 2021.
13. *Nonequilibrium hydrodynamic fluctuations driven by concentration and temperature gradients across a transpiration membrane*. 21st NIST Symposium on Thermophysical Properties, (virtual), June 2021.
12. *Rheology of dense granular flows near the flow-arrest transition*. APS Division of Fluid Dynamics Annual Meeting, (virtual), November 2020.
11. *Connections between bulk rheology and fabric of dense granular flows at the flow-arrest transition*. Society of Rheology Annual Meeting, Raleigh, NC, October 2019.
10. *Statistical and continuum modeling of dense granular flows at the flow-arrest transition*. 3rd IMA Conference on Dense Granular Flows, DAMTP, University of Cambridge, UK, July 2019.
9. *Discrete element simulations of Li-ion electrodes using Brownian and granular dynamics*. Finite Elements in Fluids Conference, Chicago, IL, April 2019.
8. *Normal stresses in frictional granular flows*. APS Annual March Meeting, Boston, MA, March 2019.
7. *Predictions of granular flow-arrest transition and continuum rheology*. Gordon Research Conference on Granular Matter (poster), Easton, MA, July 2018.
6. *Stress-based simulations: predictions of granular flow-arrest transition and continuum rheology*. U.S. National Congress on Theoretical and Applied Mechanics, Chicago, IL, June 2018.
5. *Pressure-dependent structure and mechanics of grafted gold nanoparticle superlattices*. APS Annual March Meeting, Los Angeles, CA, March 2018.
4. *Stress-induced flow-arrest transitions in frictional granular materials*. APS Annual March Meeting, Los Angeles, CA, March 2018.
3. *Creep and aging in jammed granular materials*. APS Annual March Meeting, Baltimore, MD, March 2016.
2. *Microstructure and thermal conductivity modeling of granular nanoplatelet assemblies*. 32nd International Thermal Conductivity Conference, West Lafayette, IN, April 2014.
1. *Shear-induced failure in jammed nanoparticle assemblies*. Powders and Grains, Sydney, Australia, July 2013.

PROFESSIONAL ACTIVITIES

Conferences

Organizer, Focus Sessions on Nonequilibrium Mechanics of Granular Materials, APS March Meeting, Las Vegas, NV, March 2023

Co-Organizer, Minisymposium on Multiphase Flows, SIAM-CSE, Amsterdam, Netherlands, February 2023

Chair, Gordon Research Seminar on Granular Matter, Easton MA, July 2022

Organizer, Focus Session on Nonlinear Response of Complex Granular Materials, APS March Meeting, Chicago, IL, March 2022

Session Chair, Invited Session on Flow of Dense Granular Materials and Suspensions, APS March Meeting (virtual), March 2021

Session Co-Chair, Granular Physics and Geomechanics, Society of Engineering Sciences Technical Meeting (virtual), September 2020

Co-Chair, Gordon Research Conference Connects on Granular Matter (virtual), September 2020

Discussion Leader, Gordon Research Seminar on Batteries, Ventura CA, February 2020

Discussion Leader, Gordon Research Seminar on Granular Matter, Easton MA, July 2018

Ad-hoc Journal Reviewer

Physical Review (Letters/E/Fluids/Research/Applied), Nature Communications, Journal of Fluid Mechanics, Granular Matter, Soft Matter, Journal of Electrochemical Society, Computational Materials Science, Journal of Physical Chemistry, Joule, Journal of Applied Mechanics, Open Geomechanics, Computational Particle Mechanics

Proposal Reviewer

Army Research Office (ARO), October 2022

National Science Foundation, Petroleum and Geochemistry Program, October 2021

U.S. Department of Energy, Small Business Innovation Research, Office of Advanced Scientific Computing Research, November 2020

Memberships

American Physical Society, Society for Industrial and Applied Mathematics, Society of Engineering Sciences

TEACHING

Purdue University

- Instructor, Thermal Energy at the Nanoscale (online course), *Summer 2015*
- Teaching Assistant, Numerical Methods in Heat, Mass and Momentum Transfer (PhD course), *2016*
- Teaching Assistant, Thermal Energy at the Nanoscale (Masters Course), *2015*
- Teaching Assistant, Heat and Mass Transfer (Undergraduate course), *2010 - 2015*

MENTORING

Undergraduate

Mentored research projects of undergraduate students Rajath Kantharaj (Summer Intern and Undergraduate Research Assistant, Purdue University 2015), Joseph Mynhier (SURF student, Purdue University, Summer 2015 and 2016), Ashish Ghimire (SURF Student, Purdue University, Summer 2014), Siew La Pang (SURF Student, Purdue University, Summer 2013)

Graduate

Mentored research projects of graduate students Eunji Yoo (Summer Intern, NSF-MSGI, Summer 2022), Andrew Hong (Summer Intern, Lawrence Berkeley National Laboratory, Summer 2021), Rajath Kantharaj (Graduate Researcher, Purdue University, 2016 - 2017)