

Debanjan Mukherjee, Ph.D.

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📍 ECME 275, Engineering Center
University of Colorado Boulder

Education

- 2010 – 2013 **Ph.D. Mechanical Engineering**, University of California, Berkeley
Dissertation: *Discrete Particle Simulation Techniques for the Analysis of Colliding and Flowing Particulate Media*. Advisor: Prof. Tarek I. Zohdi.
- 2008 – 2010 **M.S. Mechanical Engineering**, University of California, Berkeley
Dissertation: *Computational Design and Modeling of the Dynamics of Floating Ocean Wave Energy Converters*. Advisor: Prof. Alaa E. Mansour.
- 1998 – 2001 **B.Tech. Ocean Engineering**, Indian Institute of Technology, Madras
Thesis: *CFD Simulations of Wave Resistance on Twin-Hull Catamarans*. Advisor: Prof. P. Krishnankutty.

Awards and Honors

- 2020 **National Institutes of Health 2020 Trailblazer Award** for new and early stage investigators.
Oak Ridge Associated Universities (ORAU) 2020 Ralph E. Powe Junior Faculty Enhancement Award.
- 2019 **University of Colorado Boulder Mechanical Engineering Outstanding Graduate Educator Award 2019** for contributions towards developing a new computational fluid dynamics course.
- 2018 **Journal Cover Feature: August 2018 issue of Annals of Biomedical Engineering** for publication “The Role Of Circle of Willis Anatomy in Cardio-embolic Stroke-A Patient-specific Simulation Based Study”.
Recipient: Insight Health Data Science Fellowship, January 2018 (declined)
- 2016 **Best Poster Award: 5th International Conference on Engineering Frontiers in Pediatric and Congenital Heart Disease (3rd place in Young Investigator Competition).**
- 2014 **Best Poster Award: Society of Petroleum Engineers (SPE) International Oilfield Corrosion Conference and Exhibition.**
- 2013 **Selected as Institute Fellow for the ‘Summer Institute for Preparing Future Faculty’ by the Graduate Division, University of California, Berkeley.**
- 2011 **Outstanding Graduate Student Instructor Award: Graduate Introduction to Finite Element Analysis.**
- 2010 **Best Paper Award: 29th International Conference on Ocean & Offshore, and Arctic Engineering.**
Outreach for Engineers Specialty Forum Scholarship by ASME-IPTI for the International Conference on Ocean & Offshore, and Arctic Engineering.
Allen D. Wilson Memorial Scholarship by the Department of Mechanical Engineering, University of California, Berkeley.
Renewable Energy Scholarship Award by the Berkeley Energy & Resources Collaborative (BERC).
- 2009 **Block Grant Award by the Department of Mechanical Engineering, University of California, Berkeley.**
- 2002 **Student delegate at the “CSIR Programme for Youth Leadership in Science 2002” by the Council of Scientific and Industrial Research (CSIR), Government of India.**

Professional Experience

- 2019 – present **Assistant Professor**, Mechanical Engineering, University of Colorado Boulder
Program Faculty, Biomedical Engineering Program, University of Colorado Boulder
Faculty Council Member, BioFrontiers Institute, University of Colorado Boulder
- 2018 – 2019 **Visiting Assistant Professor**, Mechanical Engineering, University of Colorado Boulder
- 2014 – 2018 **Postdoctoral fellow**, University of California Berkeley
Cardiovascular fluid mechanics; Supervisor: Prof. Shawn C. Shadden
American Heart Association Postdoctoral Fellowship (01/2016 – 12/2018)

Professional Experience (continued)

2013 – 2013 **Assistant Specialist Researcher**, University of California, Berkeley
Research in magnetic particle flows; Supervisor: Prof. Tarek I. Zohdi

Research Interests

- **Biomedical:** Image-based modeling for biofluids and biomechanics; Hemodynamics and vascular transport processes; Cerebrovascular flow; Biomechanics of cardiovascular diseases – stroke, thrombosis, embolisms; Cardiovascular biomedical device design; Biomedical image processing; Drug delivery.
- **Computational:** Computational fluid dynamics and transport processes; Fluid-particle and Fluid-structure interaction; Multiscale modeling; Infectious disease transmission modeling; Finite element method; Discrete element method; Molecular Dynamics; High-performance computing.
- **Flow Physics:** Multi-phase and particle-laden flows; Granular flows/dynamics; Collective dynamics of particle systems; Statistical physics of particle dynamics and transport; Particulate flows in industrial and manufacturing systems.

Research Publications

Patents

2020 ■ “Rapid Non-invasive Detection of Respiratory Diseases.” Sinha, M., Sen, C., Gulati, I., and **Mukherjee, D.** U.S. Provisional Pat. Ser. No. 63/060875, Filed August 04, 2020.

Peer-Reviewed Journal Publications

- 2021 ■ Teeraratkul, C., Irwin, Z., Shadden, S.C., and **Mukherjee, D.** (2020). Computational Investigation Of Blood Flow And Flow-mediated Transport In Arterial Thrombus Neighborhood. *Biomechanics and Modeling in Mechanobiology*. [pre-print: bioRxiv 2020.06.11.147488] (accepted; in press).
- **Mukherjee, D.** (2020) Developing Effective Screencast Modules For Teaching Computational Techniques In Remote Modalities. *Biomedical Engineering Education* (accepted; in press; pre-print available upon request).
- 2020 ■ Miller, S., **Mukherjee, D.**, Wilson, J., Clements, N., and Steiner, C. (2020). Implementing A Negative-Pressure Isolation Space Within A Skilled Nursing Facility To Control SARS-CoV-2 Transmission. *American Journal of Infection Control*. [pre-print: medRxiv 2020.07.04.20143123] (accepted, in press).
- 2018 ■ **Mukherjee, D.**, Jani, N.D., Narvid, J., and Shadden, S.C. (2018). The Role Of Circle of Willis Anatomy In Cardio-embolic Stroke – A Patient-specific Simulation Based Study. *Annals of Biomedical Engineering*. 46(8):1128-1145. [pre-print: bioRxiv-190579].
- **Mukherjee, D.**, and Shadden, S.C. (2018). Modeling Blood Flow Around A Thrombus Using A Hybrid Particle-Continuum Approach. *Biomechanics and Modeling in Mechanobiology*. 17(3):645-663.
- 2017 ■ **Mukherjee, D.**, and Shadden, S.C. (2017). Inertial Particle Dynamics In Large Artery Flows – Implications For Modeling Arterial Embolisms. *Journal of Biomechanics*. 52(8):155-164.
- Casas, G.*, **Mukherjee, D.***, Celigueta, M.A., Zohdi, T.I., and Onate, E. (2017). A Modular, Partitioned, Discrete Element Framework For Industrial Grain Distribution Systems With Rotating Machinery. *Journal of Computational Particle Mechanics*. 4(2):181-198.
- 2016 ■ **Mukherjee, D.**, Jani, N., Selvaganesan, K., Weng, C.L., and Shadden, S.C. (2016). Computational Assessment Of The Relation Between Embolism Source And Embolus Distribution To The Circle Of Willis For Improved Understanding Of Stroke Etiology. *Journal of Biomechanical Engineering*. 138(8):081008-081008-13.
- 2015 ■ **Mukherjee, D.**, Padilla, J., and Shadden, S.C. (2015). Numerical Investigation Of Fluid-particle Interactions For Embolic Stroke. *Theoretical and Computational Fluid Dynamics*. 30(1):23-39.
- **Mukherjee, D.**, and Zohdi, T.I. (2015). A Discrete Element Based Simulation Framework To Investigate Particulate Spray Deposition Processes. *Journal of Computational Physics*. 290:298-317.
- **Mukherjee, D.**, and Zohdi, T. I. (2015). Computational Modeling Of The Dynamics & Interference Effects Of An Erosive Granular Jet Impacting A Porous, Compliant Surface. *Granular Matter*. 17(2):231-252.

Research Publications (continued)

- Mukherjee, D., Zaky, Z., Zohdi, T.I., Salama, A., and Sun, S. (2015). Investigation Of Guided Particle Transport For Noninvasive Healing Of Damaged Piping System Using Electro-Magneto-Mechanical Methods. *Journal of Society of Petroleum Engineers*. 20(4):872-883.
- 2014 ■ Mukherjee, D., and Zohdi, T. I. (2014). Electromagnetic Control Of Charged Particulate Spray Systems - Models For Planning The Spray-gun Operations. *Computer-Aided Design*. 46:211-215.

Peer-Reviewed Journal Publications (Submitted)

- Teeraratkul, C., and Mukherjee, D. Microstructure Aware Modeling Of Biochemical Transport In Arterial Blood Clots. (*submitted*) [*pre-print*: bioRxiv 10.1101/2021.01.25.428179].
- Kang, T., Mukherjee, D., Kim, J.M., Park, K.Y., and Ryu, J. Effects Of Progressive Carotid Stenosis On The Hemodynamics Of The Circle of Willis: Aorta-to-Cerebral 3D Patient-Specific Simulation. (*submitted*; *in-review*; *pre-print available on request*).

Peer-Reviewed Proceedings

- 2021 ■ Sahni, A., Pal, J., and Mukherjee, D. Assessing The Hemodynamic Influence Of Pulse Flow Modulation For Left Ventricular Assist Devices. *Proceedings of the Summer Biomechanics, Bioengineering, and Biotransport Conference, Vail, Colorado*. (*submitted*).
- Wilson, J., Miller, S., Clements, N., Steiner, C., and Mukherjee, D. A Computational Modeling Framework For SARS-CoV-2 Infection Transmission And Control In Enclosed Indoor Spaces. *Submission to the CFD and Covid-19 Minisymposium; AIAA Aviation Forum; 2021*. (*in review*).
- 2020 ■ Teeraratkul, C., and Mukherjee, D. (2020). Parallel Implementation Of A Hybrid Particle-continuum Finite Element Framework For Blood Clot Biomechanics. *Supercomputing 20*. November 2019.
- Khadangale, S.B., Hajebrahimi, S., Ferguson, V.L., Lynch, M.E., and Mukherjee, D. (2020). Fluid-Structure Interaction Framework For Fluid Flow Through The Bone Lacunar-Canalicular System With Morphological Variations. *Proceedings of the Summer Biomechanics, Bioengineering, and Biotransport Conference, Vail, Colorado*.
- 2017 ■ Mukherjee, D., and Shadden, S.C. (2017). Fictitious Domain Particle-Based Modeling For Thrombosis. *Proceedings of the Summer Biomechanics, Bioengineering, and Biotransport Conference, Tucson, Arizona*.
- Mukherjee, D., Jani, N.D., and Shadden, S.C. (2017). Discrete Particle Modeling For Thrombotic And Embolic Phenomena In Arteries. *Proceedings of the 5th International Conference on Computational and Mathematical Biomedical Engineering, Pittsburgh, Pennsylvania*.
- 2016 ■ Mukherjee, D., and Shadden, S.C. (2016). Towards Non-invasive, Computational Modeling Of The Transport Of Thrombo-Emboli And Athero-Emboli Along Arteries. *Proceedings of the Summer Biomechanics, Bioengineering and Biotransport Conference, National Harbor, Maryland*.
- 2015 ■ Mukherjee, D., and Shadden, S.C. (2015). Insights Into The Hemodynamic Factors Affecting Embolus Transport For Stroke. *Proceedings of the Summer Biomechanics, Bioengineering and Biotransport Conference, Snowbird, Utah*.
- 2013 ■ Mukherjee, D., and Zohdi, T.I. (2013). Computer Modeling and Simulation Framework for Particulate Spray Based Manufacturing Processes. *Proceedings of the ASME International Mechanical Engineering Congress & Exposition, San Diego, California*.
- 2010 ■ Mukherjee, D., and Mansour, A.E. (2010). Preliminary Concept and Feasibility Studies on Ocean Energy Device Design from Used Ships. *Proceedings of the 29th International Conference on Ocean & Offshore, and Arctic Engineering, Shanghai, China*. - **[best paper award]**

Articles In Preparation

- Sahni, A., Pal, J., and Mukherjee, D. Quantitative Assessment Of Aortic Hemodynamics For Varying Left Ventricle Assist Device Graft Anastomosis And Flow Pulsation. (*in preparation*).

Presentations

Conference Presentations

- 2020
- **Mukherjee, D.** Devising Strategies For Online And Remote Teaching Of Computational Fluid Dynamics Concepts. *73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics*. November 2019. (held online)
 - Sahni, A., Beiter, A., Pal, J., and **Mukherjee, D.** Assessing Hemodynamics In The Ascending Aorta Due To Surgical Anastomosis And Flow Modulation Of Left Ventricular Assist Device. *73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics*. November 2019. (held online)
 - Pullutasis, B., and **Mukherjee, D.** Quantification Of Arterial Flow Using Planar Digital Subtraction Angiography Image Data With Applications To Hepatic Circulation. *73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics*. November 2019. (held online)
 - Wilson, J., Miller, S., Clements, N., Steiner, C., and **Mukherjee, D.** A Coupled Lagrangian Model For Flow-mediated Transmission Of SARS-CoV-2 Through Respiratory Ejecta In A Skilled Nursing Facility. *73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics*. November 2019. (held online)
 - Teeraratkul, C., and **Mukherjee, D.** Quantification Of The Hemodynamic Environment Around Large Arterial Blood Clots. *73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics*. November 2019. (held online)
 - Wilson, J., Miller, S., Clements, N., Steiner, C., and **Mukherjee, D.** Flow Physics Informed Design Of A Negative Pressure Isolation Space For SARS-CoV-2 In A Skilled Nursing Facility. *CCTSI CU-CSU Summit VIII: Covid-19 and the Colorado Research Environment* August 2020 (held online due to Covid-19). [selected for lightning talk]
 - Sahni, A., Beiter, A., and **Mukherjee, D.** Variations In Aortic Hemodynamics Due To Surgical Anastomosis And Flow Modulation In Left Ventricle Assist Devices. *The 6th Annual Rocky Mountain Fluid Mechanics Research Symposium, Boulder, Colorado*. August 2020. (held online due to Covid-19).
 - Teeraratkul, C., and **Mukherjee, D.** Understanding Flow-mediated Transport In The Arterial Thrombus Neighborhood. *The 6th Annual Rocky Mountain Fluid Mechanics Research Symposium, Boulder, Colorado*. August 2020. (held online due to Covid-19).
 - Wilson, J., Miller, S., Clements, N., Steiner, C., and **Mukherjee, D.** Flow Physics Modeling For SARS-CoV-2 Negative Pressure Isolation Space In A Skilled Nursing Facility. *The 6th Annual Rocky Mountain Fluid Mechanics Research Symposium, Boulder, Colorado*. August 2020. (held online due to Covid-19).
 - Teeraratkul, C., Irwin, Z., and **Mukherjee, D.** Hemodynamic Phenomena At The Blood-Thrombus Interface - Implications For Thrombosis. *The 14th World Congress on Computational Mechanics, Paris, France*. July 2020. (modified virtual format presentation held January 2021).
 - Teeraratkul, C., and **Mukherjee, D.** Parallel Implementation Of A Hybrid Particle-Continuum Finite Element Framework For Blood Clot Biomechanics. *The 10th Annual High Performance Computing Symposium, Rocky Mountain Advanced Computing Consortium, Boulder, Colorado*. May 2020. [best poster award]
- 2019
- **Mukherjee, D.** Computational Investigations On Flow-mediated Transport Processes At The Blood-thrombus Interface. *72nd Annual Meeting of the American Physical Society Division of fluid Dynamics, Seattle, Washington*. November 2019.
 - **Mukherjee, D.** Developing A New CFD Course Based On Open Source Tools: Design Experience And Student Outcomes. *72nd Annual Meeting of the American Physical Society Division of fluid Dynamics, Seattle, Washington*. November 2019.
 - Khadangale, S., Hajebrahimi, S., Lynch, M.E., and **Mukherjee, D.** Computational Analysis Of Interstitial Fluid Flow Through The Lacunar-canalicular System With Morphological Variations. *72nd Annual Meeting of the American Physical Society Division of fluid Dynamics, Seattle, Washington*. November 2019.
 - Kang, T., **Mukherjee, D.**, Kim, J.M., Park, K.Y., and Ryu, J. Computational Study Of Hemodynamic Nature In Patient-specific Cerebrovasculature With Lenticulostriate Artery Under ICA Stenosis Conditions. *72nd Annual Meeting of the American Physical Society Division of fluid Dynamics, Seattle, Washington*. November 2019.
 - **Mukherjee, D.** Image-driven Particle-based Methods For Stroke And Thrombosis. *VI International Conference On Particle-based Methods. Fundamentals And Applications, Barcelona, Spain*. October, 2019.

Presentations (continued)

- 2018
- **Mukherjee, D.**, Jani, N.D., Narvid, J., and Shadden, S.C. Computational Investigations On Cerebral Vasculature Anatomy And Its Role In Embolic Stroke. *The 15th United States National Congress on Computational Mechanics, Austin, Texas.* July 2019.
 - **Mukherjee, D.**, Diamond, S.L., and Shadden, S.C. Towards Developing Hybrid Particle-continuum Frameworks For Thrombosis And Embolization Biomechanics In Large Arteries. *The 8th World Congress Of Biomechanics, Dublin, Ireland.* July 2018.
 - **Mukherjee, D.**, and Shadden S.C. Hybrid Particle-continuum Computational Models For Thrombus Biomechanics. *The 13th World Congress On Computational Mechanics, New York City, New York.* July 2018.
 - Pyne, J., **Mukherjee, D.**, Ryu, J., Narvid, J., and Shadden S.C. Computational Quantification Of Cerebrovascular Flow During A Trans-catheter Aortic Valve Implantation (TAVI) Procedure. *The Heart and Brain Symposium, Chicago, Illinois.* June 2018.
 - **Mukherjee, D.**, and Shadden. S.C. The Role Of Hemodynamics In Organizing Transport In Thrombus Neighborhood. *2018 Cellular and Molecular Bioengineering Conference, Biomedical Engineering Society, Key Largo, Florida.* January 2018.
- 2017
- **Mukherjee, D.**, Garduno, J., and Shadden, S.C. Flow-mediated Transport Around A Macroscopic Arterial Thrombus. *70th Annual Meeting Of The American Physical Society Division Of Fluid Dynamics, Denver, Colorado.* November 2017.
 - Pyne, J., **Mukherjee, D.**, Narvid, J., Bowen, M., Dehkhargani, S., and Shadden, S.C. Approximating Ischemic Stroke Location And Abnormal Tissue Regions Through Subtracting NCCT And CTA Scans. *The 14th Annual UCSF Imaging Research Symposium, San Francisco, California.* October 2017.
 - **Mukherjee, D.**, and Shadden, S.C. Discrete Particle Techniques For Modeling Fragmentation Of Blood Clots. *14th United States National Congress On Computational Mechanics, Montreal, Canada.* July 2017.
 - **Mukherjee, D.**, and Shadden, S.C. Particle-based Computational Techniques For Stroke And Thrombosis. *Berkeley/Stanford Computational Mechanics Festival (CompFest), Berkeley, California.* April 2017.
- 2016
- **Mukherjee, D.**, and Shadden, S.C. Fictitious Domain Based Models For Resolving Interaction Of A Clot With Blood Flow. *69th Annual Meeting Of The American Physical Society Division Of Fluid Dynamics, Portland, Oregon.* November 2016.
 - Jani, N.D., **Mukherjee, D.**, and Shadden, S.C. Evaluating Blood Flow And Embolus Distribution In The Brain As A Function Of The Anatomy Of The Circle Of Willis. *69th Annual Meeting Of The American Physical Society Division Of Fluid Dynamics, Portland, Oregon.* November 2016.
 - Jani, N.D., **Mukherjee, D.**, and Shadden S.C. Influence Of Variations In Circle Of Willis Anatomy On Cerebral Circulation & Embolus Distribution. *Annual Meeting Of The Biomedical Engineering Society, Minneapolis, Minnesota.* October 2016.
 - **Mukherjee, D.**, and Shadden, S.C. Thrombus Hemodynamics Interactions: From Intra-Thrombus Transport To Macro-Scale Flow Structures. *Mechbio Symposium: Putting Together The Cell Mechanome, San Diego, California.* August 2016.
 - **Mukherjee, D.**, and Shadden, S.C. Modeling Embolus Transport & Thrombus Interaction With Arterial Hemodynamics & Its Relevance To Improving Treatment Procedures. *The 5th International Conference on Engineering Frontiers In Pediatric & Congenital Heart Disease, Orlando, Florida.* June 2016. - [best poster award]
 - **Mukherjee, D.**, Jani, N.D., and Shadden, S.C. Characterizing Embolus Transport To The Circle Of Willis. *The 8th International Bio-Fluids Symposium, Pasadena, California.* February 2016.
- 2015
- **Mukherjee, D.**, Jani, N.D., and Shadden, S.C. Modeling And Simulation Of Cardiogenic Embolic Particle Transport To The Brain. *68th Annual Meeting Of The American Physical Society Division Of Fluid Dynamics, Boston, Massachusetts.* November 2015.
 - Casas, G., **Mukherjee, D.**, Celigueta, M.A., Zohdi, T.I., and Onate, E. Large-Scale Grain Distribution Simulations With Rotating Machinery Using Efficient Discrete Element Models. *Particles 2015 - IV International Conference On Particle-Based Methods: Fundamentals And Applications, Barcelona, Spain.* September 2015.
 - **Mukherjee, D.**, and Shadden, S.C. Embolus Interactions With Blood Flow And Its Role In Stroke. *13th United States National Congress On Computational Mechanics, San Diego, California.* July 2015.

Presentations (continued)

- 2014 **■ Mukherjee, D.,** and Shadden, S.C. A Patient-Specific CFD-Based Study Of Embolic Particle Transport For Stroke. *67th Annual Meeting Of The American Physical Society Division Of Fluid Dynamics, San Francisco, California.* November 2014.
- Mukherjee, D.,** Zaky, Z., Zohdi, T.I., Salama, A., and Sun, S. Investigation Of Noninvasive Healing Of Damaged Piping System Using Electro-Magneto-Mechanical Methods. *Society Of Petroleum Engineers International Oilfield Corrosion Conference And Exhibition, Aberdeen, United Kingdom.* May 2014. - **[best poster award]**
- 2013 **■ Mukherjee, D.,** and Zohdi, T.I. Collision Driven Particle Dynamics Simulations For Analyzing Flows Of Particulate Sprays And Jets. *66th Annual Meeting Of The American Physical Society Division Of Fluid Dynamics, Pittsburgh, Pennsylvania.* November 2013.
- Mukherjee, D.,** and Zohdi, T.I. Electromagnetic Control Of Charged Particulate Spray Systems - Planning The Spray-Gun Operations. *SIAM Conference On Geometrical And Physical Modeling, Denver, Colorado.* November 2013.
- Mukherjee, D.,** and Zohdi, T.I. Discrete Particle Simulation For The Analysis Of Colliding And Flowing Particulate Media. *Berkeley/Stanford Computational Mechanics Festival (CompFest), Berkeley, California.* October 2013.
- Mukherjee, D.,** and Zohdi, T.I. Development Of A Computer Simulation Tool For Discrete Element Method And Collision Driven Particle Dynamics Simulations. *12th United States National Congress On Computational Mechanics, Raleigh, North Carolina.* July 2013.

Invited Presentations And Seminars

- 2020 **■ Unraveling The Role Of Fluid Flow In Stroke And Thrombosis** - invited talk at the Mechanical Engineering Seminar Series, Rice University, Houston, November 2020.
- In Silico Approaches For Patient-specific Investigations On Stroke And Embolisms** - invited talk at the Stroke/NH Didactics, Department of Neurology, University of Colorado School of Medicine, Anschutz Medical Campus, August 2020.
- 2019 **■ Modeling Local Transport Processes In Arterial Blood Clots Using Particle Methods** - invited talk at the "Vascular Biomechanics In Development And Disease" symposium in the Society of Engineering Science (SES) meeting, St. Louis, October 2019.
- In Silico We Trust! Noninvasive Insights On Physiological Systems Using Computational Platforms** - 'Faculty Show And Tell' research talk at the BioFrontiers Institute, University of Colorado, Boulder, October 2019.
- 2018 **■ Computational Investigations On Unravelling The Hemodynamic Underpinnings Of Cardiovascular Diseases** - invited talk at the Department of Mechanical Engineering, the University of Colorado Boulder, March 2018.
- Particles In Flow: Computational Insights Into The Rich Dynamics Of Particle Systems With Applications In Manufacturing And Biomechanics** - invited talk at the Department of Mechanical and Aerospace Engineering, the University at Buffalo, February 2018.
- Insights Into Developing Patient-specific Computational Fluid Dynamics Models For Cardiovascular Diseases** - invited talk at the Department of Mechanical Engineering, Villanova University, February 2018.
- Computational Investigations On The Hemodynamic Underpinnings Of Cardiovascular Diseases** - invited talk at the Department of Mechanical Engineering, University of Nevada, Reno, January 2018.
- 2017 **■ Understanding Blood Flow And Flow Mediated Transport Around Arterial Blood Clots** - invited talk at the Berkeley Fluids Seminar Series, U.C. Berkeley, October 2017.
- Discrete Particle Based Computational Techniques For Investigating The Role Of Hemodynamics In Stroke And Thrombosis** - invited talk at Department of Mathematics, University of Houston, September 2017.
- Exploring The Hemodynamic Underpinnings Of Stroke, Thrombosis, And Embolisms** - invited talk at Auburn University, September 2017.
- Hybrid Particle-continuum Modeling For Thrombosis And Embolism - An Overview** - invited talk at the Diamond Lab, Institute for Medicine and Engineering, University of Pennsylvania, August 2017.
- Collective Dynamics And Flow Of Particle Systems: Applications In Industry And Healthcare** - invited talk at the Department of Mechanical Engineering, Stony Brook University, April 2017.
- 2016 **■ Image-driven, Particle Based Computational Models For Thrombotic And Embolic Phenomena In Large Arteries** - invited talk at the Berkeley Fluids Seminar series, U.C. Berkeley, October 2016.

Presentations (continued)

- 2013 ■ *Image-based Computational Modeling Of Thrombotic And Embolic Phenomena In Large Arteries* - invited talk at Medtronic Neurovascular, Irvine, California, June 2016.
- 2013 ■ *Discrete Particle Simulations For The Analysis Of Colliding And Flowing Particulate Media* - invited talk at the Berkeley Fluids Seminar series, U.C. Berkeley, October, 2013.
- *Discrete Element And Collision Driven Particle Dynamics Simulations For Manufacturing* - invited talk at Siemens Energy, Orlando, Florida, April, 2013.
- *The Story Of Sprays, Grains, And Computers - An Overview Of Probing Granular & Particulate Material Using Computer Simulations* - invited talk at the Department of Physics, Indian Institute of Science Education & Research, Bhopal, India, January 2013.

Software

- **VCPrePost**: Open source package for facilitating particle-based modeling in biological flows.
Role: Creator, developer, maintainer.
Link: <https://gitlab.com/dbnbn/vcprepost-release>

Research Funding

Completed

- 2016-2017 ■ **American Heart Association:**
Title: *A Meso-scale Discrete Element Framework for Simulations of Thrombus Growth and Embolization*;
Award Number: 16POST27500023;
Award Amount: \$ 90,000.00
- **Burroughs Wellcome Fund:**
Title: *Large Artery Thrombosis: Unifying Microscale Experiments And Mesoscale Computations*;
Award Number: 1016360;
Award Amount: \$ 5,240.00

Ongoing

- 2020 - 2023 ■ **National Institutes of Health - NIBIB R21:**
Title: *In Silico Mapping of the Heart-Brain Embolus Transport Pathway for Stroke*;
Award Number: R21EB029736;
Award Amount: \$ 584,301.00
- 2020 - 2021 ■ **University of Colorado Anschutz-Boulder (AB) Nexus:**
Title: *Stroke Risk Assessment For Improved Left Ventricle Assist Device Therapy In Heart Failure Patients*;
Award Number: *AB Nexus Research Collaboration Grant*;
Award Amount: \$ 50,000.00
- **Oak Ridge Associated Universities**
Title: *Benchmark Flow-loop System For Stroke*.
Award Number: *Through Ralph Powe Junior Faculty enhancement Award*;
Award Amount: \$ 10,000.00.
Note: *award amount includes matching funds from Paul M Rady Mechanical Engineering Department.*
- **Extreme Science and Engineering Discovery Environment (XSEDE):**
Title: *Computational Methods For Investigating Blood Flow And Transport Within And Around Arterial Blood Clots*;
Award Number: TG-MCB200188; **Award Amount**: 50,000 core hours.

Research Supervision

Principal Advisor: Ph.D. - Ongoing

- 2020 - present **■ Lindsey Nast:** Mechanical Engineering, University of Colorado Boulder.
2019 - present **■ Chayut Teeraratkul:** Mechanical Engineering, University of Colorado Boulder.

Principal Advisor: M.S. Thesis - Ongoing

- 2020 - present **■ Joseph Wilson:** Mechanical Engineering, University of Colorado Boulder
2019 - present **■ Byron Pullutasig:** Mechanical Engineering, University of Colorado Boulder
 ■ Akshita Sahni: Mechanical Engineering, University of Colorado Boulder.

Principal Advisor: M.S. - Completed

- 2019-2020 **■ Shailesh B. Khadangale:** Mechanical Engineering, University of Colorado Boulder.
 ■ Zachariah Irwin: Mechanical Engineering, University of Colorado Boulder.

Principal Advisor: Undergraduate

- 2020 - present **■ Autumn Marie Zemlicka:** Mechanical Engineering, University of Colorado Boulder.
 ■ Andrew Beiter: Mechanical Engineering, University of Colorado Boulder.
 ■ Andrea Chamorro: Computer Science, University of Colorado Boulder.
2019 - 2020 **■ Colin Armstrong:** Mechanical Engineering, University of Colorado Boulder.
 ■ Afnan Dean Al Haj: Mechanical Engineering, University of Colorado Boulder.

*Prior to Joining University of Colorado Boulder

- *2015-2018 **■ Supervisor and mentor:** undergraduate student researchers working on computational fluid dynamics of the cerebral vasculature; Mechanical Engineering; University of California, Berkeley.
 - Anusree Oruganti
 - Abhinav Koppu
 - Aditya Aiyer
 - Neel D. Jani
 - Kartiga Selvagesan
 - Christopher Lee Weng

Teaching

Lecture-Based Courses

- 2021 **■ MCEN 4228/5228-005:** Computational Fluid Dynamics; Spring 2021 (*ongoing*)
2020 **■ MCEN 4228/5228-009:** Macroscale Biofluid Mechanics; Fall 2020
 (*developed brand new course from scratch*).
 ■ MCEN 4228/5228-005: Computational Fluid Dynamics; Spring 2020.
2019 **■ MCEN 5021:** Introduction to Fluid Dynamics; Fall 2019
 (*cross-listed with ASEN 5051: Fluid Mechanics; Aerospace Engineering Dept.*).
 ■ MCEN 4228/5228-005: Computational Fluid Dynamics; Spring 2019
 (*developed brand new course from scratch*)

Graduate Independent Study Supervision

- 2020 **■ Akshita Sahni:** Spring 2020.
 Topic: *Image-based Modeling in Biomechanics.*

Undergraduate Independent Study Supervision

- 2019 **■ Afnan Dean Al Haj:** Spring 2019
 Topic: *Fluid Particle Modeling Techniques with Applications in Stroke Biomechanics.*

Teaching (continued)

- **Zachariah Irwin:** Spring 2019
Topic: *Lagrangian Analysis Techniques for Complex Flows.*

Guest Lectures

- 2020 ■ **MCEN 4228/5228-003; Fall 2020;** Mechanical Engineering; University of Colorado Boulder
Guest lecture titled “*Hemodynamic Phenomena in Microfluidic Systems: An Overview*”
- 2019 ■ **MCEN 4133/5133; Spring 2019;** Mechanical Engineering; University of Colorado Boulder
Guest lecture titled “*The Biomechanics of Blood Clots*”

*Prior to Joining University of Colorado Boulder

- *2015 ■ **Training and pedagogy:** Selected for the *Intensive College Level Teaching* program organized by the Postdoc Teaching Opportunities Program (PTOP); University of California, Berkeley; October 2015. (20/73 applicants selected).
- *2014 ■ **Instructor:** Bootcamp session on *Basics of MATLAB Programming* for students at the Transfer To Excellence Research Experience for Undergraduates (TTE REU) program; University of California, Berkeley. [summer]
 - **Guest Lecturer:** *Software Tools for Hemodynamics Modeling*; for graduate course titled Fluid Mechanics of Biological Systems; Department of Mechanical Engineering; University of California, Berkeley. [spring]
- *2013 ■ **Instructor and Co-organizer:** Freshman Energy Engineering Seminar Series; College of Engineering; University of California, Berkeley. [fall]
 - **Training and pedagogy:** Selected as an institute fellow for the *summer Institute for Preparing Future Faculty* by the Graduate Division, University of California, Berkeley.
 - **Capstone Mentor:** Mentor and supervisor for capstone project on gas turbine blade thermomechanical design with Siemens Corporation; Department of Mechanical Engineering; University of California, Berkeley. [spring]
- *2012 ■ **Graduate Teaching Assistant:** Course title: *Computational Design of Multi-functional Materials*; Level: *graduate*; Mechanical Engineering; University of California, Berkeley. [spring]
 - **Graduate Teaching Assistant:** Course title: *Graduate Introduction to Finite Element Analysis*; Level: *graduate*; Mechanical Engineering; University of California, Berkeley. [fall]
 - **Capstone Mentor:** Mentor and supervisor for capstone project on gas turbine blade thermomechanical design with Siemens Corporation; Department of Mechanical Engineering; University of California, Berkeley. [fall]
- *2011 ■ **Graduate Teaching Assistant:** Course title: *Microprocessor Based Mechanical Systems*; Level: *undergraduate*; Mechanical Engineering; University of California, Berkeley. [spring]
- *2010 ■ **Graduate Teaching Assistant:** Course title: *Measurement Systems for Mechatronics*; Level: *undergraduate*; Mechanical Engineering; University of California, Berkeley. [spring]
- *2009 ■ **Graduate Teaching Assistant:** Course title: *Experimentation and Measurements*; Level: *undergraduate*; Mechanical Engineering; University of California, Berkeley. [fall]
 - **Graduate Teaching Assistant:** Course title: *Experimentation and Measurements*; Level: *undergraduate*; Mechanical Engineering; University of California, Berkeley. [spring]
- *2008 ■ **Graduate Teaching Assistant:** Course title: *Experimentation and Measurements*; Level: *undergraduate*; Mechanical Engineering; University of California, Berkeley. [fall]

Journal And Peer-Review Service

Journal Editorial Board

- 2020 – present ■ **Editorial Board Member: Review Editor:** *Computational Physiology and Medicine*; speciality section of *Frontiers in Bioengineering and Biotechnology* and *Frontiers in Physiology*.

Journal And Peer-Review Service (continued)

Proposal Reviews

- 2019 **Review Panel:** University of Colorado Research and Innovation Office (RIO) Seed Grant Program.

Journal Peer-Reviews

- ongoing **Reviewer** (current and completed) for the following international journals:
- *Computational Mechanics*;
 - *Journal of Computational Particle Mechanics*;
 - *Journal of Computational Physics*;
 - *Journal of Biomechanical Engineering*;
 - *British Journal of Radiology*;
 - *International Journal for Numerical Methods in Engineering*;
 - *PLoS One*;
 - *Journal of Biomechanics*;
 - *Current Opinion in Biomedical Engineering*;
 - *Computer Modeling in Engineering and Science*;
 - *Cardiovascular Engineering and Technology*;
 - *Applied Mathematical Modeling*;
 - *Biomechanics and Modeling in Mechanobiology*;
 - *Annals of Biomedical Engineering*;
 - *International Journal for Numerical Methods in Biomedical Engineering*;
 - *Journal of Neurovirology*;
 - *Computer Methods in Applied Mechanics and Engineering*;
 - *Engineering Reports*;
 - *AiChE Journal*.

Professional Service

Conferences and Workshops

- 2021 **Co-organizer:** *Minisymposium: Multiphysics and Data-driven Modeling for Cardiovascular Biomedicine* at the 2021 United States National Congress on Computational Mechanics, Chicago (*and held virtually; scheduled*).
- 2020 **Co-chair:** *Curated Virtual Poster Walk* Poster Session at the CCTSI CU-CSU Summit VIII: Covid-19 and the Colorado Research Environment, August 2020 (*held online due to Covid-19*).
- Co-organizer:** *Minisymposium: Computational Multiphysics Modeling of Cardiovascular Systems* at the 2020 World Congress on Computational Mechanics, Paris, France. (*held online due to Covid-19*).
- Review committee member:** *The Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C)* 2020, Vail, Colorado (*held online due to Covid-19*).
- 2019 **Co-organizer:** *Minisymposium: Computational Multiphysics Modeling of Cardiovascular Systems* at the 2019 United States National Congress on Computational Mechanics, Austin, Texas.
- Review committee member:** *The Summer Biomechanics, Bioengineering and Biotransport Conference (SB3C)* 2019, Seven springs, Pennsylvania.
- 2018 **Co-organizer:** *Minisymposium: Computational Multiphysics Modeling of Cardiovascular Systems* at the 2018 United States National Congress on Computational Mechanics, New York City, New York.
- 2016 **Co-organizer:** Inaugural edition of the AmeriMech mechanobiology symposium titled *Putting Together The Cell Mechanome: Finding The Pieces, Building The Puzzle*, August 2016, San Diego, California.
- 2013 **Co-organizer:** *The Berkeley-Stanford Computational Mechanics Festival (CompFest)* workshop, October, 2013, Berkeley, California.

Professional Memberships

- American Heart Association**
- Biomedical Engineering Society**

Professional Service (continued)

- American Physical Society
- United States Association for Computational Mechanics

Faculty Service

- 2020–2021
- **Graduate Committee:** Department of Mechanical Engineering, University of Colorado Boulder
 - **Organizer:** *ME Distinguished Zoominar Series*, Department of Mechanical Engineering, University of Colorado Boulder.
- 2019–2020
- **Faculty Lead:** Oral Preliminary Examination Committee; Fluid Mechanics; Department of Mechanical Engineering, University of Colorado Boulder.
 - **Graduate Committee:** Department of Mechanical Engineering, University of Colorado Boulder.
 - **Organizer:** *Distinguished Seminar Series*, Department of Mechanical Engineering, University of Colorado Boulder.
- 2018–2019
- **Graduate Committee:** Department of Mechanical Engineering, University of Colorado Boulder.
 - **Faculty Lead:** Oral Preliminary Examination Committee; Fluid Mechanics; Department of Mechanical Engineering, University of Colorado Boulder.

Student Service

Ph.D. Dissertation Committee

- 2021
- **Corey W. Nelson:** Mechanical Engineering, University of Colorado Boulder.
Advisor: Prof. John A Evans; Defense: January, 2021
Title: *Interactive Geometric Domain Iteration Of Massively Parallel CFD Simulations*
- 2020
- **Caelan Lapointe:** Mechanical Engineering, University of Colorado Boulder.
Advisor: Prof. Peter Hamlington; Defense: October, 2020
Title: *Efficient Simulation Of Complex Fire Phenomena In OpenFOAM Using Adaptive Mesh Refinement.*
 - **Olga Doronina:** Mechanical Engineering, University of Colorado Boulder.
Advisor: Prof. Peter Hamlington; Defense: August, 2020
Title: *Turbulence Model Development Using Approximate Bayesian Computation.*
 - **Xu Han:** Civil, Environmental, and Architectural Engineering, University of Colorado Boulder.
Advisor: Prof. Wangda Zuo; Defense: August, 2020
Title: *Holistic Optimization Of Data Center Cooling Systems And Airflow Management.*

M.S. Thesis Committee

- 2020
- **Guoxiang (Grayson) Tong:** Mechanical Engineering, University of Colorado Boulder.
Advisor: Prof. John Evans; Defense: April 2020
- 2019
- **Samira Hajebrahimi:** Mechanical Engineering, University of Colorado Boulder.
Advisor: Prof. Maureen E. Lynch; Defense: July 2019
 - **Matthew Hanley:** Mechanical Engineering, University of Colorado Boulder.
Advisor: Prof. Shalom Ruben; Defense: May 2019

Ph.D. Preliminary and Comprehensive Exam Committee

- 2020
- **Lawrence Smith:** Mechanical Engineering, University of Colorado Boulder.
Preliminary Exam Committee; Advisor: Prof. Robert McCurdy; Date: September 2020.
 - **Corey W. Nelson:** Mechanical Engineering, University of Colorado Boulder.
Comprehensive Exam Committee; Advisor: Prof. John Evans; Date: May 2020
 - **Xu Han:** Civil, Environmental, and Architectural Engineering, University of Colorado Boulder.
Comprehensive Exam Committee; Advisor: Prof. Wangda Zuo; Date: January 2020

Student Service (continued)

- 2019 **Jennifer Coulombe:** Interdisciplinary Quantitative Biology, University of Colorado Boulder. Preliminary Exam Committee; Advisor: Prof. Virginia Ferguson; Date: December 2019
- Olga Doronina:** Mechanical Engineering, University of Colorado Boulder. Comprehensive Exam Committee; Advisor: Prof. Peter Hamlington; Date: December 2019
- Caelan Lapointe:** Mechanical Engineering, University of Colorado Boulder. Comprehensive Exam Committee; Advisor: Prof. Peter Hamlington; Date: September 2019
- Michael Meehan:** Mechanical Engineering, University of Colorado Boulder. Preliminary Exam Committee; Advisor: Prof. Peter Hamlington; Date: September 2019

Outreach Activity

- 2020 **Mentor:** The 2020 Mechanical Engineering Summer Program for Undergraduate Research (ME-SPUR) (*mentored two undergraduate researchers as part of this program*).
- Diversity Panel Moderator:** *Diversity and Inclusion in the Fluid Mechanics Community*. The 6th Annual Rocky Mountain Fluid Mechanics Research Symposium, Boulder, CO, August 2020.
- 2019 **Mentor:** The CU Science Discovery Program, University of Colorado Boulder (*mentored two high school students*).

*Prior to Joining University of Colorado Boulder

- *2017 **Mentor:** *Transfer To Excellence Research Experience For Undergraduates (TTE-REU)* - mentored undergraduate exchange student Jocelyn Garduno.
- Mentor:** *New York Academy of Sciences STEM Scholar Mentorship Program* - aimed at high-school STEM students from across the world.
- *2016 **Mentor:** *Berkeley Engineering Research Experience For Teachers (BE-RET)* - mentored two K-12 educators as part of this program:
 - **Suzanne LeBaron:** science educator from Oakland High School District.
 - **Russell Bierle:** pre-service teacher from the CalTeach program at Berkeley.
- *2015 **Mentor:** *Transfer To Excellence Research Experience For Undergraduates (TTE-REU)* - mentored undergraduate exchange student Tiffany Pan.
- Volunteer:** *Biomechanical Engineering in Healthcare* - an outreach event for middle school students organized through the Johns Hopkins Center for Talented Youth (JHU-CTY).
- *2014 **Mentor:** *Transfer To Excellence Research Experience For Undergraduates (TTE-REU)* - mentored undergraduate exchange student Jose Padilla.
- *2012 **Workshop Organizer:** *Discipline Cluster Workshop* for teaching conference aimed at training and mentoring first time graduate teaching assistants; GSI Teaching and Resource Center; University of California, Berkeley.
- *2010 **Math Instructor:** *Pre-Collegiate Academy, Incentive Awards Program*, University of California, Berkeley - developed and taught a complete six-week course on calculus for this preparatory program for high-performing high school students from underserved communities.

References

- References available upon request.**