Spencer H. Bryngelson

Title: Assistant Professor, School of Computational Science & Engineering
Assistant Professor by Courtesy (0%), Daniel Guggenheim School of Aerospace Engineering
Assistant Professor by Courtesy (0%), George W. Woodruff School of Mechanical Engineering

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Citizenship: USA (natural-born)

Contents

1 Education

- University of Illinois at Urbana–Champaign
  - (2017) Doctor of Philosophy, Theoretical & Applied Mechanics
    Advisor: Jonathan Freund
  - (2015) Master of Science, Theoretical & Applied Mechanics
  - (2015) Graduate Certificate, Computational Science & Engineering
- University of Michigan–Dearborn
  - (2013) Bachelor of Science, Mechanical Engineering
  - (2013) Bachelor of Science, Engineering Mathematics

2 Positions held

- (2021–Present) Assistant Professor, School of Computational Science & Engineering, College of Computing, Georgia Institute of Technology
- (2023–Present) Assistant Professor by Courtesy (0%), Daniel Guggenheim School of Aerospace Engineering, College of Engineering, Georgia Institute of Technology
- (2024–Present) Assistant Professor by Courtesy (0%), George W. Woodruff School of Mechanical Engineering, College of Engineering, Georgia Institute of Technology
- (2025–Present) Associate Director, Center for Research into Novel Compute Hierarchies (CRNCH), Georgia Institute of Technology
- (2025) Visiting Professor, Pacific Northwest National Laboratory, Department of Energy
- (2025) Summer Faculty Research Program, Office of Naval Research, NSWC Carderock
- (2022) Visiting Scholar, Stanford University, Center for Turbulence Research (Summer Program)
- (2018–21) Senior Postdoctoral Scholar, California Institute of Technology, with Tim Colonius
- (2019) Visiting Researcher, Massachusetts Institute of Technology, with Themis Sapsis
- (2018) Postdoctoral Researcher, XPACC (PSAAP II center), with Carlos Pantano, Dan Bodony, Jon Freund
- (2013–17) Graduate Research Fellow, University of Illinois at Urbana–Champaign, with Jon Freund
- (2015) Alumni Teaching Fellow, University of Illinois at Urbana–Champaign
- (2012–13) Undergraduate Research Assistant, University of Michigan–Dearborn, with Eric Ratts

3 Teaching

3.1 Georgia Institute of Technology

Semester	Number	Course Title	Students
Spring 2026	CSE 6730	Modeling & Simulation	—
Fall 2025	CSE 6010	Computational Problem Solving	39
Spring 2025	CSE 6730	Modeling & Simulation	180
Fall 2024	CX/MATH 4640	Numerical Analysis I	45
Spring 2024	CSE 6730	Modeling & Simulation	163
Fall 2023	CX/MATH 4640	Numerical Analysis I	53
Spring 2023	CSE 6730	Modeling & Simulation	146
Fall 2022	CX/MATH 4640	Numerical Analysis I	36
Fall 2021	CX/MATH 4640	Numerical Analysis I	43

Note: I co-teach VIP (2/3/3/4)60(1/2) *Team Phoenix: Cluster Competition Team (HPC)* with Prof. R. Vuduc each Fall and Spring since Fall 2022.

3.2 Other institutions

Semester	Number	Course Title	Students	Institute
Fall 2015	ME310	Fundamentals of Fluid Dynamics	82	UIllinois
Fall 2013	ME3601	Design and Analysis of Machine Elements	35	UMichigan
Spring 2012	ME364	Probability, Statistics, and Reliability in Design	32	UMichigan
Fall 2012	ME230	Statics and Mechanics of Materials	61	UMichigan

4 Students

4.1 Staff

- Dr. Tianyi Chu, Postdoctoral Fellow
- Daniel Vickers, Research Staff

4.2 Ph.D.

- Dimitrios Adam (CSE/AE)
- Jesus Arias (CSE/AE)
- Max Hawkins (CSE), co-advised with R. Vuduc
- Anand Radhakrishnan (CSE)
- Zhixin Song (Physics)
- Benjamin Wilfong (CSE)
- Haocheng Yu (CSE/AE), co-advised with K. Ahuja
- Mark Zhang (CSE), co-advised with Q. Tang

4.3 Undergraduate

- Melody Lee (CS)

4.4 Alumni

4.4.1 Graduate students

- Fatima Ezahra Chrit, Ph.D. ME, co-advised with Alex Alexeev, 2021–23. Next: CFD Engineer, IronCAD
- Anshuman Sinha, M.S. CSE, 2022–23. Next: Intern, LLNL; ML engineer, Apple

4.4.2 Undergraduate students

- Mohammed Al-Mahrouqi, AE, 2025
- Tanush Prathi, CS, 2025
- Ajay Bati, CS, 2021–23. Next: Intern, Apple
- Arjun Bhamra, CS, 2022–23. Next: Intern, Quantinuum; Intern, IBM; Researcher, TINKER Lab (T. Conte, GT)
- Rasmit Devkota, Physics, 2023. Next: Research Scientist (GTRI)
- Ansh Gupta, CS, 2022–24. Next: YCombinator startup, co-founder
- Yash Kothari, CS, 2022–23. Next: Co-founder, Inika AI
- Henry Le Berre, CS, 2021–25. Next: Propulsion Software Engineer, SpaceX
- Suzan Manasreh, CS, 2024. Next: Intern, NVIDIA; BSMS CS (GT)
- Sriharsha Kocherla, CS, 2022-24. Next: Intern (Quant, Chicago Trading); MSCS (GT); Quant., Old Mission

- Subrahmanyam Mullangi, CS, 2023–24. Next: Xantium Group, Tudor
- Brian Ok, CS, 2024–25 (GT OSPO VSIP Program).
- Lian Xiang (Physics). Next: Ph.D. student, RPI
- Qi Zeng, CS & Math, co-advised with F. Schäfer, 2021–23. Next: MSCS (UCBerkeley); ML Engineer, TikTok; Software Engineer, Google Cloud AI

4.5 Student and scientist accolades

- (2025) Melody Lee, GT PURA Salary Award
- (2025) Benjamin Wilfong, Winner, OLCF User Group Visualization Showcase
- (2024) Benjamin Wilfong, GT CRNCH Fellowship
- (2024) Elizabeth Hong, GT PURA Salary Award
- (2024) Suzan Manasreh, GT PURA Salary Award
- (2024) Subrahmanyam Mullangi, GT PURA Salary Award
- (2023) Dr. Bryan Gard (GTRI Research Scientist), IRAD of the Year award
- (2023) Qi Zeng, Outstanding Undergraduate Researcher Award, College of Computing (co-advised with F. Schäfer)
- (2023) Ansh Gupta, GT PURA Salary Award
- (2022) Fatima Chrit, Georgia Tech Quantum Alliance Fellowship
- (2022) Zhixin (Jack) Song, GT CRNCH Fellowship
- (2022) Benjamin Wilfong, GT President's Fellowship

5 Awards

- (2025) ACM Gordon Bell Prize, Finalist
- (2025) Winner, OLCF User Group Visualization Showcase
- (2022) Ralph E. Powe Junior Faculty Enhancement Award, Oak Ridge National Lab
- (2022–23) Georgia Tech Faculty Writing Scholar
- (2022–23) Class of 1969 Teaching Fellow, Georgia Institute of Technology
- (2018) Stanley Weiss Outstanding Dissertation Award, University of Illinois at Urbana–Champaign
- (2016) Hassan Aref Award (research in fluid mechanics), University of Illinois at Urbana–Champaign
- (2015) Alumni Teaching Fellowship, University of Illinois at Urbana–Champaign
- (2010–13) Dean's List, University of Michigan–Dearborn
- (2011) Pi Tau Sigma (honor society, member), University of Michigan–Dearborn

6 Research support

6.1 Funded grants

6.1.1 Current

1. (2025–30) Institutional PI: DOE PSAAP IV PSC DE-NA0004263, "*Center for Multiscale Modeling of Multiphase Combustion*" ($10M, GT Share: $1M, SHB Share: $1M); Director: S. Balachandar (UFlorida)
2. (2025–30) Institutional PI: DOE PSAAP IV FIC DE-NA0004261 "*Center for Information Geometric Mechanics and Optimization*" ($5M, GT Share: $1.2M, SHB Share: $669K) Co-directors: B. Keith (Brown) and F. Schäfer (NYU)
3. (2025–26) PI: DOE DE-NA0003525 (Sandia National Laboratories subcontract), "*Vibrated bubbly flow simulation*" ($113K)
4. (2025) PI: Visiting Professor, DOE Pacific Northwest National Laboratory, Subcontract 802894 of

DE-AC05-76RL01830, "*Quantum Simulation of Fluid Dynamics*" ($42K)

5. (2023–28) co-PI: DOD ONR MURI N00014-23-1-2501, "*Combustion of solid fuels in high enthalpy flow*" ($3.8M) PI: G. Young (Virginia Polytechnic Institute and State University), 7 other co-PIs. SHB Share: $270K Y1–3
6. (2024–27) co-PI: DOD ONR N00014-24-1-2094 "*Multi-scale simulations of combustion in a solid propellant ramjet with embedded reactive metal particles*" ($375K), PI: S. Menon (GT), SHB Share: $188K
7. (2023–27) PI: DOD ARO W911NF-23-10324, "*Investigation and inference of soft material deformation mechanisms unlocked at large speeds, finite deformations, and many cycles*," collaborative with University of Michigan, Jon Estrada. (Total: $835K; SHB Share: $314K)
8. (2022–26) PI: DOD ONR N00014-22-12519, "*Stochastic framework for cavitating flows: mesoscale modeling and acceleration*" ($560K)

6.1.2 Completed

1. (2024–25) PI: DOE DE-NA0003525 (Sandia National Laboratories subcontract), "*Vibrated bubbly flow simulation*" ($113K)
2. (2024–25) Senior personnel: DARPA HR-0011-472506 "*Squid-inspired nozzles for enhanced efficiency and thrust in rotary propulsors*" ($400K), PI: S. Bhamla (GT), SHB Share: $150K
3. (2024) PI: DOE DE-AC52-07NA27344 (Lawrence Livermore National Laboratories subcontract), "*Accelerated, Compressed, and Regularized Computation of Kinetic-based PDEs*" ($80K)
4. (2023–24) PI: DOE DE-NA0003525 (Sandia National Laboratories subcontract), "*Vibrated bubbly flow simulation*" ($100K)
5. (2023–24) co-PI: DARPA HR-0011-2330006, "*Quantum eigensolvers in fluid-dynamic computations and applications*" ($300K), PI B. Gard (Georgia Tech Research Institute), SHB Share: $100K
6. (2022–23) PI: DOE DE-NA0003525 (Sandia National Laboratories subcontract), "*Vibrated bubbly flow simulation*" ($65K)
7. (2022–23) PI: DOE ORAU Powe, "*A methodologically coherent multi-scale model for multiphase flow*" ($10K)
8. (2022–23) co-PI: GTRI IRAD, "*Quantum optimization for lattice Boltzmann simulation (QOLBS)*" ($40K), PI: B. Gard (Georgia Tech Research Institute)
9. (2022) PI: GT Seed Grant, Forming Teams "*Quantum computing for next-generation engineering simulation*" ($50K)
10. (2022) PI: GTQA DE-0001321I, "*Quantum algorithms for lattice Boltzmann fluid flow simulation*" ($14.5K)

6.2 Funded resource and hardware awards

1. (2026–27) PI: DOE Innovative and Novel Computational Impact on Theory and Experiment (INCITE) Award, "*Exascale-enabled Simulation of Cavitation for Medicine and Beyond*" (700K node hours, OLCF Frontier), co-PIs: T. Colonius, M. Rodriguez, F. Liu, R. Budiardja
2. (2025–26) co-PI: DOE ASCR Leadership Computing Challenge Award (ALCC), "*Multiphase Mixing Induced by Interface Breakup*" (495K node hours, OLCF Frontier), PI: R. M. McMullen (Sandia National Labs)
3. (2024–Present) PI: ACCESS-CI Maximize TG-PHY240200, "*Direct simulation of compressible multiphase flow*" (225K GPU Hours, 55K CPU Hours, $119K value)
4. (2024–Present) PI: ACCESS-CI Accelerate TG-PHY210084, "*High-fidelity simulation of high-flowing dispersions*" (3M ACCESS Credits, $24K value)
5. (2021–Present) PI: Oak Ridge National Lab CFD154, Director's Discretionary, "*Accelerated sub-grid multi-component flow physics*" (100K node hours+)
6. (2024–25) PI: Jülich Supercomputing Center, JUPITER Exascale Early Access Program, "*ExaMFlow:*

Exascale simulation enables multiphase flow simulation at the finest scales"

7. (2021–23) PI: ACCESS-CI Discovery TG-PHY210084, "*High-fidelity simulation of high-speed flowing dispersions via a stochastic sub-grid model*" (10K GPU Hours, 20K CPU Hours, $7.5K value)
8. (2024) co-PI: Georgia Tech Tech. Fee, "*Next Generation NVIDIA HPC Cluster*" (4x NVIDIA GraceHopper Superchip nodes, $250K)
9. (2022) PI: NVIDIA Academic Hardware Grant Program (4x BlueField-2 E-Series DPU, $12K value)
10. (2022) PI: Georgia Tech Tech. Fee "*ARM HPC Dev Kits for next-generation supercomputing*" (10x NVIDIA ARM HPC Dev. Kits, $240K)
11. (2022) PI: AMD MI200-series GPU Server ($77K value)
12. (2022) PI: NVIDIA Academic Hardware Grant Program (2x A100 80GB PCIe GPUs, $30K value)
13. (2019–20) co-PI: XSEDE TG-CTS120005, "*Advanced immersed boundary and interface-capturing methods for simulations of complex flows*" (9M CPU hours, $71K value)

6.3 Other awarded funds

- (2023) PI: SIAM CSE Travel Award ($1K)
- (2023) PI: APS FECS Travel Grant ($350)
- (2022) PI: Stanford CTR Summer Program "*Fast macroscopic forcing for operator recovery via locality and causality with application to compressible and multiphase flow*" ($8K, with F. Schäfer, SHB share: $4K)

7 Professional activity

7.1 Appointments and memberships

- (2025–Present) OLCF User Group Executive Board, Member
- (2024–Present) University Consortium for Applied Hypersonics (UCAH)
- (2022–Present) Association for Computing Machinery (ACM), Member
- (2021–Present) NATO Science & Technology Organization, Technical Team Member
- (2021–Present) American Institute of Aeronautics & Astronautics (AIAA), Member
- (2015–Present) Society of Industrial and Applied Mathematics (SIAM), Member
- (2014–Present) American Physical Society (APS), Member

7.2 Referee

7.2.1 Journals and Conferences

- AIAA Journal
- Applied Mathematical Modelling
- Applied Ocean Research
- Computers and Fluids
- Computers and Mathematics with Applications
- Computers in Biology and Medicine
- Computer Methods in Applied Mechanics and Engineering
- Computer Standards & Interfaces
- Current Opinion in Chemical Engineering
- European Journal of Mechanics – B/Fluids
- Fluids
- IEEE International Parallel & Distributed Processing Symposium
- International Journal of Multiphase Flow
- International Journal of Offshore and Polar Engineering
- Journal of Computational Physics
- Journal of Computational Science
- Journal of Fluid Mechanics
- Measurement
- Multidiscipline Modeling in Materials and Structures
- Nature Communications Physics
- Ocean Engineering

- PEARC (Practice and Experience in Advanced Research Computing)
- Physical Review A
- Physical Review E
- Physical Review Fluids
- Physical Review Research
- Physical Review X
- PLOS Computational Biology
- Quantum Science and Technology
- SC (International Conference for High Performance Computing, Networking, Storage, and Analysis)
- SIAM Multiscale Modeling & Simulation
- SIAM Scientific Computing
- Soft Matter
- SoftwareX
- Symposium of Naval Hydrodynamics
- Theoretical and Computational Fluid Dynamics

7.2.2 Research proposals

Israel Science Foundation, US Department of Defense (Army Research Office), US National Science Foundation (ENG), ACS Research Funds

8 Service and outreach

8.1 Georgia Tech

8.1.1 Institute-level

- (2021–Present) Georgia Tech *HPC Hackathon*, initiator and organizer, recruited sponsors Oak Ridge National Lab and NVIDIA
- (2022–Present) Georgia Tech *Scientific Software Engineering Center*, Advisory Board
- (2022–Present) PURA Award Reviewer
- (2024) Schmidt Science Polymaths Award Reviewer
- (2022,2023) ORAU Powe Award Reviewer
- (2022) Faculty Search Panel, Professional Development Workshops, Georgia Tech Center for Teaching and Learning

8.1.2 College-level

- (2025) CRNCH Summit Organizer (with H. Kim, T. Krishna, D. Mahajan, S. Yu)
- (2024–Present) Modeling & Simulation, School of CSE, Area lead
- (2022–Present) VIP Team Phoenix–Cluster Competition Team, Faculty advisor
- (2021–Present) TSO advisory committee representative
- (2022–24) CSE communication committee
- (2021–24) Seminar series organizer (with F. Schäfer)
- (2023) Computational Mathematics Activity Group (organized by N. Chandramoorthy)
- (2023) CRNCH Summit Panel organizer and moderator (with R. Vuduc)
- (2022) Organizer, Georgia Scientific Computing Symposium (with E. Chow and X. Zhang)
- (2022) Judge, CS Junior Design Capstone Expo
- (2021–22) Graduate student admissions committee

8.1.3 Student examination committees

Ph.D. Thesis defense

- (2025) Liana Hatoum (COE BME)
- (2024) Hohyun Lee (COE ME)
- (2023) Fatima Ezahra Chrit (COE ME)
- (2022) Achyut Panchal (COE AE)
- (2022) Wangwei Lan (COS Physics)

Ph.D. Thesis proposal

- (2024) Micaiah Smith-Pierce (COE AE)
- (2024) Sara Karamati (COC CSE)
- (2023) Liana Hatoum (COE BME)
- (2023) Hohyun Lee (COE ME)
- (2022) Johnie Sublett (COC CSE)

Ph.D. Qualifying examination

- (2025) Jacob Tronge (COC CSE)
- (2025) Mehdi Karimi (COE ME)
- (2025) Sijian Tan (COE AE/CSE)
- (2025) Jasrayman Thind (COE AE/CSE)
- (2024) Srikanth Avasarala (COC CSE)
- (2024) Benjamin Wilfong (COC CSE)
- (2024) Jesus Arias (COC CSE)
- (2024) Lynn Jin (COS Physics)
- (2024) Sijian Tan (COE AE)
- (2023) Ayush Jain (COC CSE)
- (2023) Grayson Harrington (COC CSE)
- (2022) Anand Radhakrishnan (COC CSE)
- (2022) Johnie Sublett (COC CSE)
- (2021) Bradley Baker (COC CSE)
- (2021) Conlain Kelly (COC CSE)
- (2021) Sam Swanson (COC CSE)

Other

- (2025) M.S. Thesis proposal; Joseph Walker Brown (COE AE)
- (2025) M.S. Thesis proposal; Filippo Di Benedetto (COE AE)
- (2023) M.S. Thesis defense; Felix Luo (COE AE)
- (2023) M.S. Thesis proposal; Felix Luo (COE AE)

8.2 External

- (2025) Mini-symposium organizer, "Cavitation and Bubble Dynamics," 2025 Society of Engineering Science (SES) Technical Meeting (with M. Rodriguez, J. Estrada, J. Yang)
- (2025) Presenter, APS FECS (Forum for Early Career Scientists) Career Panel: Life in Academia
- (2024) Session chair, International Conference on Theoretical and Applied Mechanics
- (2024) Session chair, International Conference on Numerical Methods in Multiphase Flows
- (2024) Sorting committee, American Physical Society, Division of Fluid Dynamics
- (2022–Present, bi-annual) Panel Referee, ACCESS-CI Maximize
- (2021–Present, annual) Mentor, GPU Hackathons (with Oak Ridge National Lab, NVIDIA, NASA)
- (2021,22,24) Session chair, American Physical Society, Division of Fluid Dynamics
- (2021,23) Poster judge, American Physical Society, Division of Fluid Dynamics
- (2023) Mini-symposium organizer and session chair, "Statistical Approaches to Closure Modeling in Computational Mechanics," IACM Conference on Mechanistic Machine Learning and Digital Engineering for Computational Science, Engineering & Technology (MMLDT-CSET)
- (2023) Session chair, 11th International Conference on Multiphase Flow
- (2022) Supercomputing (SC) Mentor (via Mentor–Protege program)
- (2022) Supercomputing (SC) Early Career Program
- (2021–22) Research mentor, XSEDE EMPOWER (Expert Mentoring Producing Opportunities for Work, Education, and Research; program received HPCwire 2021 Editors' Choice Award in Workforce Diversity and Inclusion Leadership)

- (2021) Mini-symposium organizer and session chair, "Machine learning for multiphase flows," IACM Conference on Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology (MMLDT-CSET)
- (2020) Research mentor, Schmidt Academy for Software Engineering
- (2019) Research mentor, WAVE undergraduate research program for under-represented students, Caltech
- (2015, 2016) Judge, Illinois State-wide Math Competition
- (2014) Organizer, Science Night, Illinois Middle Schools

9 Media

- (2025) Record-Breaking Simulation Boosts Rocket Science and Supercomputing to New Limits; Georgia Tech [LINK]
- (2025) Gordon Bell Prize Winners Push Open Science Boundaries With NVIDIA-Powered Supercomputers; NVIDIA [LINK]
- (2025) Gordon Bell finalist team pushes scale of rocket simulation on El Capitan; LLNL [LINK]
  - Also propagated by: HPCwire, Interesting Engineering, Newswise
- (2025) Tracking the fiery path of particles: UF leads combustion research; UFlorida [LINK]
- (2025) It Is Rocket Science; NCSA [LINK]
  - Also propagated by: AIwire, EurekAlert!, Quantum Zeitgeist
- (2025) Fluid flow simulation on Frontier earns Gordon Bell finalist selection; ORNL [LINK]
  - Also propagated by: HPCwire, insideHPC, OLCF
- (2025) Users of Oak Ridge Leadership Computing Facility Gather for 21st Annual Meeting; OLCF [LINK]
- (2025) Shock Treatment for CFD Simulations; OLCF [LINK]
  - Also propagated by: HPCwire, insideHPC
- (2025) GT Supports Launch of Europe's Fastest Supercomputer; Georgia Tech [LINK]
  - Also propagated by: TechXplore, Interesting Engineering
- (2025) The OLCF's Problem Busters; OLCF [LINK]
- (2024) Featured: Art of HPC: Red Blood Cells Flowing Through a Microaneurysm Using High-Performance Computing; Georgia Tech [LINK]
- (2024) Researchers Blazing New Trails with Superchip Named After Computing Pioneer; Georgia Tech [LINK]
- (2023) GTRI, Georgia Tech Use Quantum Computing to Optimize CFD Applications; Georgia Tech Research Institute [LINK]
- (2023) Group Optimizes Fluid Dynamics Simulator on World's Fastest Supercomputer; Georgia Tech [LINK]
- (2023) Researchers Optimize HPC Software at Interdisciplinary Hackathon; Georgia Tech [LINK]
- (2022) New Hardware Brings Students Closer to Exascale Computing; Georgia Tech [LINK]
- (2022) Faculty Receives New GPUs for Fluid Dynamics and Machine Learning Research; Georgia Tech [LINK]

10 Publications

Bolding indicates advised or co-advised students and postdocs.

10.1 Preprints

[PP7] **Chu, T.**, Estrada, J. B, Bryngelson, S. H., (2025). "Accelerating Bayesian optimal experimental design via local radial basis functions: Application to soft material characterization". arXiv:2505.13283. DOI: 10.48550/arXiv.2505.13283.

[PP6] Jawetz, C. L., **Song, Z.**, Alexeev, A., Bryngelson, S. H., (2025). "Quantum lattice Boltzmann algorithm for heat transfer with phase change". arXiv:2509.21630. DOI: 10.48550/arXiv.2509.21630.

[PP5] Sanchez, V., Remillard, S., Abeid, B. A., Bu, L., Bryngelson, S. H., Yang, J., Estrada, J. B., Rodriguez Jr. M., (2025). "Hierarchical Bayesian constitutive model selection for high-strain-rate soft material characterization". arXiv:2511.16794. DOI: 10.48550/arXiv.2511.16794.

[PP4] **Song, Z.**, Ren, H., **Lee, M.**, Gard, B., Renaud, N., Bryngelson, S. H., (2025). "Hadamard Random Forest: Reconstructing real-valued quantum states with exponential reduction in measurement settings". arXiv:2505.06455. DOI: 10.48550/arXiv.2505.06455.

[PP3] Vaca-Revelo, D., **Wilfong, B.**, Bryngelson, S. H., Gnanaskandan, A., (2025). "Hardware-Accelerated Phase-Averaging for Cavitating Bubbly Flows". arXiv:2511.21031. DOI: 10.48550/arXiv.2511.21031.

[PP2] **Yu, H.**, Ahuja, K., Sankar, L. L., Bryngelson, S. H., (2025). "Transmission of High-Amplitude Sound through Leakages of Ill-fitting Earplugs". arXiv:2510.16355. DOI: 10.48550/arXiv.2510.16355.

[PP1] ***Yu, H.**, ***Chu, T.**, Bryngelson, S. H., (2025). "Energy dissipation mechanisms in an acoustically-driven slit". arXiv:2512.19507, *Equal contribution. DOI: 10.48550/arXiv.2512.19507.

10.2 Archival, heavily refereed papers

[P37] Bryngelson, S. H. (2026). "Fast integration method for averaging polydisperse bubble population dynamics". *Computers & Fluids* **304**, 106877. DOI: 10.1016/j.compfluid.2025.106877.

[P36] Cisneros-Garibay, E., **Le Berre, H.**, **Adam, D.**, Bryngelson, S. H., Freund, J. B., (2026). "Pyrometheus: Symbolic abstractions for XPU and automatically differentiated computation of combustion kinetics and thermodynamics". *Computer Physics Communications* **320**, 109987. DOI: 10.1016/j.cpc.2025.109987.

[P35] **Lee, M.**, **Song, Z.**, **Kocherla, S.**, Adams, A., Alexeev, A., Bryngelson, S. H., (2026). "A multiple-circuit approach to quantum resource reduction with application to the quantum lattice Boltzmann method". *Future Generation Computing Systems* **174**, 107975. DOI: 10.1016/j.future.2025.107975.

[P34] **Wilfong, B.**, **Le Berre, H.**, **Radhakrishnan, A.**, **Gupta, A.**, **Vickers, D. J.**, Vaca-Revelo, D., **Adam, D.**, **Yu, H.**, **Lee, H.**, Chreim, J. R., Carcana Barbosa, M., Zhang, Y., Cisneros-Garibay, E., Gnanaskandan, A., Rodriguez Jr. M., Budiardja, R. D., Abbott, S., Colonius, T., Bryngelson, S. H., (2026). "MFC 5.0: An exascale many-physics flow solver". *Computer Physics Communications*. In Press, 110055. DOI: 10.48550/arXiv.2503.07953.

[P33] **Chu, T.**, Estrada, J. B., Bryngelson, S. H., (2025). "Bayesian optimal design accelerates discovery of soft material properties from bubble dynamics". *Computational Mechanics* **76**, 431–447. DOI: 10.1007/s00466-025-02606-4.

[P32] **Chu, T.**, **Wilfong, B.**, Koehler, T., McMullen, R. M., Bryngelson, S. H., (2025). "Competing mechanisms at vibrated interfaces of density-stratified fluids". *Physical Review Fluids* **10**, 093904. DOI: 10.1103/r9b3-psg4.

[P31] **Song, Z.**, Deaton, R., Gard, B., Bryngelson, S. H., (2025). "Incompressible Navier–Stokes solve on noisy quantum hardware via a hybrid quantum–classical scheme". *Computers & Fluids* **288**, 106507. DOI: 10.1016/j.compfluid.2024.106507.

[P30] **Wilfong, B.**, **Radhakrishnan, A.**, **Le Berre, H. A.**, **Prathi, T.**, Abbott, S., Bryngelson, S. H., (2025). "Testing and benchmarking emerging supercomputers via the MFC flow solver". *SC Workshops '25: Proceedings of the SC '25 Workshops of the International Conference for High Performance Computing, Networking, Storage and Analysis*. DOI: 10.1145/3731599.3767424.

[P29] **Wilfong, B.**, **Radhakrishnan, A.**, **Le Berre, H.**, **Vickers, D. J.**, **Prathi, T.**, Tselepidis, N., Dorschner, B., Budiardja, R., Cornille, B., Abbott, S., *Schäfer, F., *Bryngelson, S. H., (2025). "Simulating many-engine spacecraft: Exceeding 1 quadrillion degrees of freedom via information geometric regularization". *Proceedings of SC '25: The International Conference for High Performance Computing, Networking, Storage and Analysis*. *Equal contribution. DOI: 10.1145/3712285.3771783.

[P28] Zhu, Z., Remillard, S., Abeid, B. A., Frolkin, D., Bryngelson, S. H., Yang, J., Rodriguez Jr. M., Estrada, J. B., (2025). "Parsimonious inertial cavitation rheometry via bubble collapse time". *Soft Matter* **21** 34, 6717–6734. DOI: 10.1039/D5SM00397K.

[P27] **Bati, A.**, Bryngelson, S. H., (2024). "RoseNNa: A performant, portable library for neural network inference with application to computational fluid dynamics". *Computer Physics Communications* **296**, 109052. DOI: 10.1016/j.cpc.2023.109052.

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10.3 Conference papers

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[C24] Goldstein, B., Ramsey, D. N., **Yu, H.**, Bryngelson, S. H., Ahuja, K. K., (2025). "Performance of sharply bent acoustic resonators at high sound levels". *AIAA Aviation Forum and ASCEND 2025*, 3748. DOI: 10.2514/6.2025-3748.

[C23] **Radhakrishnan, A.**, Schäfer, F., Bryngelson, S. H., (2025). "Solving diffuse interface models without tracking or dissipation". *12th International Conference on Multiphase Flow*. Toulouse, France.

[C22] Carcana Barbosa, M., Yang, J., Estrada, J. B., Bryngelson, S. H., Rodriguez Jr. M., (2024). "Numerical simulations of inertial bubble collapse near a hyperelastic object". *11th International Symposium on Cavitation*. Crete, Greece.

[C21] **Radhakrishnan, A.**, Bryngelson, S. H., (2024). "A statistics-based sub-grid model for cavitation inception and its application to complex flows". *11th International Symposium on Cavitation*. Crete, Greece.

[C20] **Radhakrishnan, A.**, Bryngelson, S. H., (2024). "A stochastic representation of sub-grid bubble dynamics toward the modeling of cavitation inception". *35th Symposium on Naval Hydrodynamics*. Nantes, France.

[C19] **Radhakrishnan, A.**, Bryngelson, S. H., (2024). "Stochastic computational methods for cavitation inception". *XXVI International Congress of Theoretical and Applied Mechanics*. Daegu, South Korea.

[C18] **Wilfong, B.**, McMullen, R. M., Koehler, T., Bryngelson, S. H., (2024). "Instability of two-species interfaces via vibration". *AIAA Aviation Forum and ASCEND 2024*, 4480. DOI: 10.2514/6.2024-4480.

[C17] **Wilfong, B.**, **Radhakrishnan, A.**, Bryngelson, S. H., (2024). "Multiphase flow numerics: Perspectives from exascale simulation". *5th International Conference on Numerical Methods in Multiphase Flows (ICNMMF5)*. Reykjavik, Iceland.

[C16] **Yu, H.**, Ahuja, K. K., Sankar, L. N., Bryngelson, S. H., (2024). "Numerical investigation of leakage of high-amplitude sound inill-fitting earplugs". *AIAA Aviation Forum and ASCEND 2024*, 4391. DOI: 10.2514/6.2024-4391.

[C15] **Le Berre, H. A.**, **Radhakrishnan, A.**, Bryngelson, S. H., (2023). "Fast simulation of multiphase compressible flows thorugh GPU acceleration". *11th International Conference on Multiphase Flow*. Kobe, Japan.

[C14] **Radhakrishnan, A.**, **Le Berre, H. A.**, Bryngelson, S. H., Chreim, J. R., Colonius, T., (2023). "A stochastic computational method for bubbly flows with first steps towards representing inception". *11th International Conference on Multiphase Flow*. Kobe, Japan.

[C13] Bryngelson, S. H., Charalampopoulos, A., Sapsis, T. P., Fox, R. O., Colonius, T., (2022). "Representing statistics of dispersions via moment methods and recurrent neural networks with application to cavitating bubbles". *34th Symposium on Naval Hydrodynamics*. Washington D.C., USA.

[C12] Bryngelson, S. H., Schäfer, F., Liu, J., Mani, A., (2022). "Fast Macroscopic Forcing Method". *Center for Turbulence Research, Proceedings of the Summer Program*. Stanford, CA, USA.

[C11] **Radhakrishnan, A.**, **Le Berre, H.**, Bryngelson, S. H., (2022). "Scalable GPU accelerated simulation of multiphase compressible flow". *The International Conference for High Performance Computing, Networking, Storage, and Analysis (SC)*. Dallas, TX, USA.

[C10] Rodriguez, M., Bryngelson, S. H., Colonius, T., (2022). "Bubble dynamics with phase change near a compliant object". *34th Symposium on Naval Hydrodynamics*. Washington D.C., USA.

[C9] Bryngelson, S. H., Colonius, T., (2021). "Closure of phase-averaged bubbly, cavitating flow models". *XXV International Congress of Theoretical and Applied Mechanics*. Milano, Italy. URL: https://vimeo.com/640932583/0ae772bf00.

[C8] Bryngelson, S. H., O'Meally, F., Colonius, T., Fox, R. O., (2021). "Conditional moment method for fully-coupled phase-averaged cavitation models". *11th International Symposium on Cavitation*. Daejeon, Korea. URL: https://vimeo.com/640931949/a6cd12fc05.

[C7] Rodriguez, M., Bryngelson, S. H., Cao, S., Colonius, T., (2021). "A unified Eulerian multiphase framework for fluid-structure interaction problems including cavitation". *XXV International Congress of Theoretical and Applied Mechanics*. Milano, Italy.

[C6] Rodriguez, M., Bryngelson, S. H., Cao, S., Colonius, T., (2021). "Acoustically-induced bubble growth and phase change dynamics near compliant surfaces". *11th International Symposium on Cavitation*. Daejeon, Korea.

[C5] Spratt, J.-S., Rodriguez, M., Bryngelson, S. H., Cao, S., Colonius, T., (2021). "Eulerian framework for bubble-cloud-kidney stone interaction". *11th International Symposium on Cavitation*. Daejeon, Korea.

[C4] Bryngelson, S. H., Colonius, T., (2020). "Phase- and mixture-averaged techniques for general bubbly flows". *33rd Symposium on Naval Hydrodynamics*. Osaka, Japan. URL: https://vimeo.com/640930931/6e57ccfd89.

[C3] Bryngelson, S. H., Colonius, T., (2019). "A comparison of ensemble- and volume-averaged bubbly flow models". *10th International Conference on Multiphase Flow*. Rio de Janeiro, Brazil.

[C2] Bryngelson, S. H., Freund, J. B., (2016). "Buckling and the rheology of an elastic capsule suspension". *XXIV International Congress of Theoretical and Applied Mechanics*. Montreal, Canada.

[C1] Freund, J. B., Bryngelson, S. H., (2016). "The stability of flowing trains of confined red blood cells". *XXIV International Congress of Theoretical and Applied Mechanics*. Montreal, Canada.

10.4 Other published content

[O3] Shahane, S., Chammas, S., Bezgin, D. A., Buhendwa, A. B., Schmidt, S. J., Adams, N. A., Bryngelson, S. H., Chen, Y.-F., Wang, Q., Sha, F., Zepeda-Núñez, L., (2024). *Rational-WENO: A lightweight, physically-consistent three-point weighted essentially non-oscillatory scheme*. arXiv.2409.09217. DOI: 10.48550/arXiv.2409.09217.

[O2] Bryngelson, S. H., Pantano, C., Bodony, D., Freund, J. B., (2018). *Adjoint-based sensitivity for flows with shocks*. Technical Report, XPACC.

[O1] Bryngelson, S. H. (2017). "Stability and transition of capsule-flow systems". Ph.D. Thesis. University of Illinois at Urbana–Champaign.

11 Talks

11.1 Invited talks

[I46] Acoustical Society of America, *Invited conference talk*, (2025).

[I45] Boeing, *CFD Community of Excellence Lecture Series*, (2025).

[I44] Courant Institute of Mathematical Sciences, *Computational Mathematics and Scientific Computing Seminar*, (2025).

[I43] DOE Pacific Northwest National Laboratory, *Environmental Technology Seminar*, (2025).

[I42] Georgia Tech IDEaS, *Cyberinfrastructure and Services for Science & Engineering Workshop*, (2025).

[I41] Oak Ridge Leadership Computing Facility (OLCF), *2025 User Meeting*, (2025).

[I40] Open Accelerated Computing (OAC) Summit, (2025).

[I39] SC25, *Gordon Bell Finalist Presentation*, (2025).

[I38] SC25, *OpenACC User Group Invited Talk*, (2025).

[I37] University of California, Berkeley, *Department of Mechanical Engineering Seminar Series*, (2025).

[I36] University of Florida, *Institute for Computational Engineering Seminar*, (2025).

[I35] University of Washington, *Department of Aerospace Engineering Seminar Series*, (2025).

[I34] Center for Research into Novel Computing Hierarchies, *CRNCH Summit*, (2024).

[I33] Naval Surface Warfare Center, Carderock Division, *Quantum Science Seminar*, (2024).

[I32] Supercomputing (SC) 2024, *ART HPC Creates*, (2024).

[I31] U.S. Navel Research Laboratory, *Computational Physics & Fluid Dynamics Seminar*, (2024).

[I30] Bayer AG, *Field Data Science Seminar*, (2023).

[I29] Georgia Institute of Technology, *George W. Woodruff School of Mechanical Engineering Seminar Series*, (2023).

[I28] Google Research, *Applied Science Seminar Series*, (2023).

[I27] Lawrence Livermore National Laboratory, *Data-driven Physics Simulation Webinar*, (2023). URL: https://www.youtube.com/watch?v=zm-iF1FtkLE.

[I26] OpenACC Webinar, (2023). URL: https://www.youtube.com/watch?v=S0gRVIkNYPg.

[I25] University of Illinois at Urbana–Champaign, *Mechanical Science and Engineering Fluids Seminar*, (2023).

[I24] Arizona State University, *Fluids Seminar*, (2022).

[I23] Brown University, *Center for Fluid Mechanics, Applied Math and Engineering*, (2022).

[I22] Center for Research into Novel Computing Hierarchies, *CRNCH Summit*, (2022). URL: https://mediaspace.gatech.edu/media/CRNCH+Summit+2022+-+Spencer+Brynglesonn+-+Quantum+Computing+for+Continuum+Mechanics/1_23u8ou36.

[I21] Emory University, *Scientific Computing Seminar Series*, (2022).

[I20] Georgia Institute of Technology, *Applied and Computational Math Seminar Series*, (2022).

[I19] Georgia Institute of Technology, *Daniel Guggenheim School of Aerospace Engineering Seminar Series*, (2022). URL: https://vimeo.com/759713173/12ef9a0220.

[I18] Georgia Scientific Computing Symposium, (2022).

[I17] Massachusetts Institute of Technology, *SAND Group*, (2022).

[I16] Office of Naval Research, *Basic Research Challenge Guest Talks*, (2022).

[I15] California Institute of Technology, *Mechanical and Civil Engineering Seminar Series*, (2021).

[I14] OpenACC Annual Summit, (2021). URL: https://youtu.be/DgX6ssX2yrg.

[I13] University of California, San Diego, *Fluid Mechanics, Combustion, & Engineering Physics Seminar Series*, (2021). URL: https://vimeo.com/640930056/b1a6c0dc62.

[I12] Georgia Institute of Technology, *Computational Science & Engineering Seminar Series*, (2020).

[I11] Massachusetts Institute of Technology, *SAND Group*, (2019).

[I10] University of Michigan–Ann Arbor, *Mechanical Engineering Seminar Series*, (2019).

[I9] University of Michigan–Dearborn, *Mechanical Engineering Seminar Series*, (2019).

[I8] University of Utah, *Mechanical Engineering Seminar Series*, (2019).

[I7] University of Vermont, *Mechanical Engineering Seminar Series*, (2019).

[I6] University of Washington, *Mechanical Engineering Seminar Series*, (2019).

[I5] California Institute of Technology, *Computational Flow Physics Group*, (2018).

[I4] California Institute of Technology, *Flow Mechanics Research Conference*, (2018).

[I3] ETH Zurich, *Computational Science & Engineering Lab*, (2017).

[I2] University of Illinois at Urbana–Champaign, *Fluid Mechanics Seminar*, (2017).

[I1] University of Illinois at Urbana–Champaign, *Biology Interest Group*, (2015).

11.2 Conference presentations

[T76] Bryngelson, S. H., **Radhakrishnan, A.**, **Wilfong, B.,** (2025). "Solving Navier–Stokes-like problems with discontinuous features via information geometric regularization". *UNCG PDE Conference 2025*.

[T75] Bryngelson, S. H., **Wilfong, B.**, **Radhakrishnan, A.**, Schäfer, F., (2025). "Simulating shock-laden and multiphase flows interface without tracking or dissipation". *Americal Physical Society, Division of Fluid Dynamics*.

[T74] Bryngelson, S. H. (2025). "Efficient computation of high-amplitude acoustics in the body: From ultrasound to noise". *188th Meeting of the Acoustical Society of America joint with 25th International Congress on Acoustics*.

[T73] Bryngelson, S. H. (2025). "High-fidelity simulation of shock-dominated high-Mach flows via information geometric regularization". *University Consortium for Applied Hypersonics (UCAH) Forum 2025*.

[T72] Bryngelson, S. H. (2025). "Shocks without shock-capturing: Extreme scale solutions to the compressible Navier–Stokes equations via inviscid geometric regularization". *Algorithms For Multiphysics Models In The Post-Moore's Law Era Workshop*.

[T71] Bryngelson, S. H., Schäfer, F., (2025). "Shocks without shock-capturing: Extreme scale solutions to the compressible Navier–Stokes equations via inviscid geometric regularization". *The Third Joint SIAM/CAIMS Annual Meetings (AN25)*.

[T70] Bryngelson, S. H., **Wilfong, B.**, **Radhakrishnan, A.,** (2025). "Numerics for diverse exascale platforms with application to multi-phase and species flow". *18th U.S. National Congress on Computational Mechanics (USNCCM)*.

[T69] **Chu, T.**, Beckett, J., Abeid, B., Estrada, J. B., Bryngelson, S. H., (2025). "Bayesian optimal design accelerates discovery of material properties from bubble dynamics". *SIAM Computational Science and Engineering*.

[T68] **Chu, T.**, **Wilfong, B.**, Koehler, T., McMullen, R., Bryngelson, S. H., (2025). "Competing mechanisms at vibrated interfaces of density-contrast fluids". *Americal Physical Society, Division of Fluid Dynamics*.

[T67] Cisneros-Garibay, E., **Adam, D.**, Bryngelson, S. H., (2025). "Symbolic computational representations of combustion thermochemistry". *International Conference on Numerical Combustion*.

[T66] **Radhakrishnan, A.**, **Le Berre, H.**, **Wilfong, B.**, Budiardja, R., Abbott, S., Bryngelson, S. H., (2025). "Compressible flow simulation on Frontier and El Capitan architectures". *APS Global Physics Summit*.

[T65] Sanchez, V., Remillard, S., Henann, D., Yang, J., Estrada, J., Bryngelson, S. H., Rodriguez Jr. M., (2025). "A theory and data integrated method for inertial microcavitation rheometry in soft materials". *The Third Joint SIAM/CAIMS Annual Meetings (AN25)*.

[T64] **Song, H.**, Subramaniam, A., Olson, B., Wu, A., Chandra, A., Bryngelson, S. H., Lele, S., (2025). "Parallel and GPU-optimized linear solver for compact difference schemes". *APS Global Physics Summit*.

[T63] **Wilfong, B.**, **Chu, T.**, McMullen, R., Koehler, T., Bryngelson, S. H., (2025). "Euler–Lagrange simulations of near-surface gas transport in vibrated bubbly flows". *Americal Physical Society, Division of Fluid Dynamics*.

[T62] Zhu, Z., Remillard, S., Abeid, B. A., Frolkin, D., Bryngelson, S. H., Yang, J., Rodriguez, M., Estrada, J. B., (2025). "Parsimonious inertial cavitation rheometry via bubble collapse time". *SES Annual Technical Meeting*.

[T61] Briney, S., Daoud, T., Bryngelson, S. H., Jackson, T. L., Balachandar, S., (2024). "Particle-resolved and Euler-Lagrange simulations of shock interaction with particle clusters using MFC". *Americal Physical Society, Division of Fluid Dynamics*.

[T60] Carcana Barbosa, M., Chreim, J. R., Tong, Z., Yang, J., Bryngelson, S. H., Henann, D., Colonius, T., Rodriguez, M., (2024). "Numerical simulations of inertial microcavitation near a gel-water interface with finite elasticity and phase change". *Americal Physical Society, Division of Fluid Dynamics*.

[T59] **Chu, T.**, Estrada, J., Bryngelson, S. H., (2024). "Bayesian optimal design accelerates discovery of material properties from bubble dynamics". *Americal Physical Society, Division of Fluid Dynamics*.

[T58] Jawetz, C., Bryngelson, S. H., Alexeev, A., (2024). "A quantum lattice Boltzmann algorithm for simulating heat transfer with phase change". *Americal Physical Society, Division of Fluid Dynamics*.

[T57] **Manasreh, S.**, Bryngelson, S. H., (2024). "Blood flow through a microaneurysm". *Art of HPC, SC '24 The International Conference on High Performance Computing, Network, Storage, and Analysis*.

[T56] **Radhakrishnan, A.**, **Le Berre, H.**, **Wilfong, B.**, Budiardja, R., Abbott, S., Bryngelson, S. H., (2024). "Compressible multi-species flow simulation on OLCF Frontier via OpenACC". *American Physical Society, March Meeting*.

[T55] Remillard, S., Zhu, Z., Abeid, B., Froklin, D., Bryngelson, S. H., Yang, J., Estrada, J. B., Rodriguez, M., (2024). "Soft material mechanical property determination using a modified Rayleigh collapse time". *Americal Physical Society, Division of Fluid Dynamics*.

[T54] Sanchez, V., Abeid, B., Yang, J., Estrada, J., Henann, D., Bryngelson, S. H., Rodriguez, M., (2024). "Bayesian constitutive model selection for inertial microcavitation rheometry". *Americal Physical Society, Division of Fluid Dynamics*.

[T53] **Song, Z.**, Gard, B., Bryngelson, S. H., (2024). "Incompressible flow simulation via a hybrid quantum-classical approach and variational algorithm". *American Physical Society, March Meeting*.

[T52] **Wilfong, B.**, **Chu, T.**, McMullen, R. M., Koehler, T., Bryngelson, S. H., (2024). "Hydrodynamic instability and breakup of a liquid-gas interface via vibration". *Americal Physical Society, Division of Fluid Dynamics*.

[T51] **Arias, J. E.**, Bryngelson, S. H., (2023). "Towards stable shock-capturing via radial basis finite differences on unstructured point clouds". *Americal Physical Society, Division of Fluid Dynamics*.

[T50] Bryngelson, S. H. (2023). "Stochastic sub-grid methods for multiphase flows at scale". *Workshop on Compressible Multiphase Flows, Stanford University*.

[T49] Bryngelson, S. H., **Le Berre, H.**, **Radhakrishnan, A.,** (2023). "Compressible multiphase flow simulation at near-exascale via a scalable GPU implementation". *American Physical Society, March Meeting*.

[T48] Bryngelson, S. H., Schäfer, F., Liu, J., Mani, A., (2023). "Super-spectral operator recovery via the fast macroscopic forcing method". *SIAM Computational Science and Engineering*.

[T47] Firouznia, M., Bryngelson, S. H., Saintillan, D., (2023). "A spectral boundary element method for interfacially driven flows". *8th Micro and Nano Flows Conference*.

[T46] **Kocherla, S.**, Bryngelson, S. H., (2023). "Reducing quantum resources for the quantum lattice Boltzmann method". *Americal Physical Society, Division of Fluid Dynamics*.

[T45] **Lee, H.**, Bryngelson, S. H., Colonius, T., (2023). "Cavitation inception in a turbulent mixing layer". *Americal Physical Society, Division of Fluid Dynamics*.

[T44] Liu, J., Bryngelson, F. S. S. H., Zaki, T., Mani, A., (2023). "Adjoint macroscopic forcing method for computing the nonlocal eddy viscosity in a turbulent channel flow". *Americal Physical Society, Division of Fluid Dynamics*.

[T43] Liu, J., Bryngelson, F. S. S. H., Zaki, T., Mani, A., (2023). "Targeted quantification of nonlocal closure operators using an adjoint-based macroscopic forcing method". *International Association for Computational Mechanics MMLDE-CSET*.

[T42] **Radhakrishnan, A.**, Bryngelson, S. H., (2023). "A statistical model for cavitation inception at the sub-grid scale". *Americal Physical Society, Division of Fluid Dynamics*.

[T41] Schäfer, F., Anandkumar, A., Bryngelson, S. H., **Kothari, Y.**, Owhadi, H., **Zeng, Q.**, Zheng, H., (2023). "Competitive gradient descent algorithms". *SIAM Computational Science and Engineering*.

[T40] **Song, Z.**, Bryngelson, S. H., (2023). "Tutorial: Solving partial differential equations (PDEs) with quantum computers". *QCE23: 2023 IEEE International Conference on Quantum Computing & Engineering*.

[T39] **Song, Z.**, Gard, B., Bryngelson, S. H., (2023). "Hybrid classical-quantum algorithm for solving the incompressible Navier–Stokes equations on quantum hardware". *Americal Physical Society, Division of Fluid Dynamics*.

[T38] **Arias, J. E.**, Bryngelson, S. H., (2022). "Radial-basis-function-based numerical methods for solving compressible flow equations at different Mach numbers". *American Physical Society, Division of Fluid Dynamics*.

[T37] **Bati, A.**, Bryngelson, S. H., (2022). "RoseNNa: A performant library for portable neural network inference with application to CFD". *American Physical Society, Division of Fluid Dynamics*.

[T36] Bryngelson, S. H. (2022). "Fast integration methods for averaging bubble dynamics at sub-grid scales". *19th U.S. National Congress on Theoretical and Applied Mechanics*.

[T35] Bryngelson, S. H., Schäfer, F., Liu, J., Mani, A., (2022). "Fast Macroscopic Forcing: Exploiting locality for operator recovery". *American Physical Society, Division of Fluid Dynamics*.

[T34] **Chrit, F. E.**, **Kocherla, S.**, Adams, A., Young, J., Alexeev, A., Bryngelson, S. H., (2022). "Quantum lattice algorithms for solving partial differential equations". *17th Conference on Theory of Quantum Computation, Communication, and Cryptography*.

[T33] **Chrit, F. E.**, **Kocherla, S.**, Alexeev, A., Bryngelson, S. H., (2022). "Quantum lattice gas algorithm for fluid flow simulations". *American Physical Society, Division of Fluid Dynamics*.

[T32] Colonius, T., Bryngelson, S. H., (2022). "Hybrid quadrature moment methods for polydisperse cavitating flows". *1st European–American–Japanese Two-Phase Flow Group Meeting*.

[T31] Firouznia, M., Bryngelson, S. H., Saintillan, D., (2022). "A spectral boundary integral method for simulating electrohydrodynamic flows in liquid droplets". *American Physical Society, Division of Fluid Dynamics*.

[T30] **Panchal, A.**, **Radhakrishnan, A.**, Bryngelson, S. H., Menon, S., (2022). "A numerical comparison of 5-, 6-, and 7-equation Baer-Nunziato-based diffuse interface methods". *American Physical Society, Division of Fluid Dynamics*.

[T29] **Radhakrishnan, A.**, **Le Berre, H.**, Bryngelson, S. H., (2022). "Towards exascale multiphase compressible flow simulation via scalable interface capturing-based solvers and GPU acceleration". *American Physical Society, Division of Fluid Dynamics*.

[T28] Rodriguez, M., Bryngelson, S. H., (2022). "Cavitation bubble growth near an elastic object". *American Physical Society, Division of Fluid Dynamics*.

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[T26] Rodriguez, M., Spratt, J.-S., Bryngelson, S. H., Colonius, T., (2022). "Numerical simulations of cavitation bubble growth and collapse near a viscoelastic object". *19th U.S. National Congress on Theoretical and Applied Mechanics*.

[T25] Spratt, J., Rodriguez, M., Bryngelson, S. H., Colonius, T., (2022). "Numerical simulations of ablation mechanisms during focused ultrasound therapies". *American Physical Society, Division of Fluid Dynamics*.

[T24] **Zeng, Q.**, Bryngelson, S. H., Schäfer, F., (2022). "Competitive physics informed networks". *ICLR workshop "Gamification and Multiagent Solutions"*.

[T23] Bryngelson, S. H., Charalampopoulos, A., Fox, R. O., Sapsis, T., Colonius, T., (2021). "Bypassing quadrature moment method instability via recurrent neural networks with application to cavitating bubble dispersions". *American Physical Society, Division of Fluid Dynamics*. URL: https://vimeo.com/650700675/06006b48de.

[T22] Bryngelson, S. H., Charalampopoulos, A., Sapsis, T., Colonius, T., (2021). "Machine learned model for non-Gaussian cavitation statistics". *International Association for Computational Mechanics MMLDT-CSET*.

[T21] Bryngelson, S. H., Colonius, T., (2021). "Statistical model for cavitating polydisperse bubble clouds". *Journal of the Acoustical Society of America*. URL: https://vimeo.com/640933361/4f9d1469ce.

[T20] Bryngelson, S. H., Colonius, T., (2021). "Sub-grid population balance model for cavitating flows". *14th Southern California Flow Physics Symposium*.

[T19] Bryngelson, S. H., Wang, Q., Cisneros-Garibay, E., Colonius, T., (2021). "GPU-accelerated quadrature moment methods". *SIAM Annual Meeting*.

[T18] Rodriguez, M., Bryngelson, S. H., Colonius, T., (2021). "Acoustically induced bubble growth with phase change". *14th Southern California Flow Physics Symposium*.

[T17] Rodriguez, M., Bryngelson, S. H., Colonius, T., (2021). "Vapor and gas bubble growth with phase transition near a wall". *American Physical Society, Division of Fluid Dynamics*.

[T16] Spratt, J.-S., Rodriguez, M., Bryngelson, S. H., Cao, S., Colonius, T., (2021). "High fidelity single framework simulations of acoustic wave–bubble cloud–elastic solid interactions". *American Physical Society, Division of Fluid Dynamics*.

[T15] Spratt, J.-S., Rodriguez, M., Bryngelson, S. H., Cao, S., Colonius, T., (2021). "Numerical Simulations of burst-wave lithotripsy in an Eulerian framework". *14th Southern California Flow Physics Symposium*.

[T14] Spratt, J.-S., Rodriguez, M., Bryngelson, S. H., Cao, S., Colonius, T., (2021). "Single-framework simulations of acoustic-wave–bubble cloud–stone interactions". *Journal of the Acoustical Society of America*.

[T13] Bryngelson, S. H., Fox, R., Colonius, T., (2020). "Conditioned quadrature moment methods for cavitating bubble dispersions". *American Physical Society, Division of Fluid Dynamics*. URL: https://vimeo.com/640933407/2830fcf3e0.

[T12] Rodriguez, M., Bryngelson, S. H., Colonius, T., (2020). "Cavitation bubble growth with phase transition near a rigid wall". *American Physical Society, Division of Fluid Dynamics*.

[T11] Spratt, J.-S., Rodriguez, M., Bryngelson, S. H., Colonius, T., (2020). "A fully Eulerian simulation framework for cavitating bubble-clouds near viscoelastic materials". *American Physical Society, Division of Fluid Dynamics*.

[T10] Bryngelson, S. H., Charalampopoulos, A., Sapsis, T. P., Colonius, T., (2019). "Neural-network-augmented Gaussian moment method for the statistics of cavitating bubble populations". *American Physical Society, Division of Fluid Dynamics*.

[T9] Bryngelson, S. H., Colonius, T., (2019). "Annular and spiral bubble nets: A simulation-focused analysis of humpback whale feeding strategies". *Journal of the Acoustical Society of America, 146(4) 2771*.

[T8] Bryngelson, S. H., Colonius, T., (2019). "Simulations and acoustics of humpback whale bubble-net feeding". *13th Southern California Flow Physics Symposium*.

[T7] Trummler, T., Schmidmayer, K., Bryngelson, S. H., Colonius, T., (2019). "Simulations of a collapsing gas bubble above a crevice". *13th Southern California Flow Physics Symposium*.

[T6] Bryngelson, S. H., Colonius, T., (2018). "Modeling approaches for bubbly, cavitating flows". *American Physical Society, Division of Fluid Dynamics*.

[T5] Bryngelson, S. H., Freund, J. B., (2017). "Floquet stability of tank-treading and tumbling capsules in viscous shear flow". *American Physical Society, Division of Fluid Dynamics*.

[T4] Bryngelson, S. H., Freund, J. B., (2017). "Global stability of fully coupled capsule flow systems". *SIAM Computational Science and Engineering*.

[T3] Bryngelson, S. H., Freund, J. B., (2017). "Stability of flowing red blood cell trains". *Blood Flow*.

[T2] Bryngelson, S. H., Freund, J. B., (2016). "Stability and transition to chaos of regular capsule trains". *American Physical Society, Division of Fluid Dynamics*.

[T1] Bryngelson, S. H., Freund, J. B., (2015). "Buckling and its effect on the confined flow of a capsule suspension". *American Physical Society, Division of Fluid Dynamics*.

12 Software

We develop and maintain MFC, an exascale multiphase and multiphysics fluid flow solver:

Name (click for Github repo.)	**Description**
MFC	Exascale simulation of multiphase/physics fluid dynamics
homebrew-mfc	Homebrew MFC tap
MicroFC	A micro MFC and CFD mini-app

More generally, our open source software is located at github.com/comp-physics, below is an auto-generated listing:

Name (click for Github repo.)	**Description**
cfd-nn	NN+CFD
HyQMOM.jl	HyQMOM 3D
RBF-NS	Radial basis functions incompressible Navier-Stokes
Quantum-HRF-Tomography	Reconstructing real-valued quantum states using Hadamard Random Forest (HRF) tomography
Quantum_Heat_LBM	Heat transfer via LBM on quantum devies
Carleman-QLBM	Carleman quantum LBM at scale
QLBM-frugal	A resource frugal quantum lattice Boltzmann method
group-docs	Group syllabus
RBC3D	3D Spectral boundary integral solver for cell-scale blood flow
MeshfreeTrixi.jl	Meshfree extension to Trixi using RBF-based numerics
MeshfreeTrixiDev	Development and testing of MeshfreeTrixi.jl
NISQ-Quantum-CFD	CFD solve on a current quantum computer
Scientific-Visualization	Scientific visualization tutorials using Paraview
CPINN	Competitive Physics Informed Networks
fully-QLBM	Code accompanying quantum LBM paper
RadialBasisFiniteDifferences.jl	Library for efficient RBF-FD
1d-shock-capturing-Euler	Simple shock capturing for 1D Euler eqns.
Quantum-PDE-Benchmark	Near-term quantum algorithm benchmarking for PDEs
deepOscillations	Flop-efficient neural integration
fast-mfm	Fast Macroscopic Forcing Method
awesome-numerics	Resources for learning about numerical methods.
qce23-qpde-tutorial	Solving PDEs with quantum algorithms: A tutorial at IEEE QCE 2023
PyQBMMlib	PyQBMMlib is a Python extension of QBMMlib
EnsAvg_1D_Tait	1D Ensemble-averaging solver for dilute bubbly flows
awesome-modeling-simulation	Resources for learning about modeling and simulation
hip_stencil_code	Stencil code for AMD GPUs
RBC2D	2D Spectral boundary integral solver for cell-scale blood flow

We also work on Inertial Microcaviation Rheometry (IMR) software:

Name (click for Github repo.)	**Description**
IMR_Bayesian_design	IMR-based Bayesian Optimal Experimental Design
IMRv2	IMR version 2
IMR_RBF_BOED	Accelerated BOED via RBFs
Intro-to-IMR	Simple codes to numerically simulate laser/ultrasound-induced inertial cavitation bubble dynamics in soft materials
IMR_data_assimilation	IMR with Data Assimilation
IMR_v1	Vanilla IMR codebase
inca	InertialCav supported by J. Estrada's group