

# 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

**Institution:** Georgia Institute of Technology

**Office Coordinates:** S1313 CODA, 756 W Peachtree St NW, Atlanta, GA 30308

**Office Phone:** (404) 894-5821

**Email:** [shb@gatech.edu](mailto:shb@gatech.edu)

**Website:** <https://comp-physics.group>

**GitHub:** [Me\[sbryngelson\]](#), [Group\[comp-physics\]](#), [MFC\[mflowcode\]](#)

**Citizenship:** USA (natural-born)

## Contents

|           |   |           |
|-----------|---|-----------|
| <b>I</b>  | <b>Education</b>                              | <b>2</b>  |
| <b>2</b>  | <b>Positions held</b>                         | <b>2</b>  |
| <b>3</b>  | <b>Teaching</b>                               | <b>2</b>  |
| 3.1       | Georgia Institute of Technology . . . . .     | 2         |
| 3.2       | Other institutions . . . . .                  | 2         |
| <b>4</b>  | <b>Students</b>                               | <b>3</b>  |
| 4.1       | Staff . . . . .                               | 3         |
| 4.2       | Ph.D. . . . .                                 | 3         |
| 4.3       | Undergraduate . . . . .                       | 3         |
| 4.4       | Alumni . . . . .                              | 3         |
| 4.4.1     | Graduate students . . . . .                   | 3         |
| 4.4.2     | Undergraduate students . . . . .              | 3         |
| 4.5       | Student and scientist accolades . . . . .     | 4         |
| <b>5</b>  | <b>Awards</b>                                 | <b>4</b>  |
| <b>6</b>  | <b>Research support</b>                       | <b>4</b>  |
| 6.1       | Funded grants . . . . .                       | 4         |
| 6.1.1     | Current . . . . .                             | 4         |
| 6.1.2     | Completed . . . . .                           | 4         |
| 6.2       | Funded resource and hardware awards . . . . . | 5         |
| 6.3       | Other awarded funds . . . . .                 | 5         |
| <b>7</b>  | <b>Professional activity</b>                  | <b>6</b>  |
| 7.1       | Appointments and memberships . . . . .        | 6         |
| 7.2       | Referee . . . . .                             | 6         |
| 7.2.1     | Journals and Conferences . . . . .            | 6         |
| 7.2.2     | Research proposals . . . . .                  | 6         |
| <b>8</b>  | <b>Service and outreach</b>                   | <b>6</b>  |
| 8.1       | Georgia Tech . . . . .                        | 6         |
| 8.1.1     | Institute-level . . . . .                     | 6         |
| 8.1.2     | College-level . . . . .                       | 7         |
| 8.1.3     | Student examination committees . . . . .      | 7         |
| 8.2       | External . . . . .                            | 7         |
| <b>9</b>  | <b>Media</b>                                  | <b>8</b>  |
| <b>10</b> | <b>Publications</b>                           | <b>8</b>  |
| 10.1      | Preprints . . . . .                           | 8         |
| 10.2      | Archival, heavily refereed papers . . . . .   | 9         |
| 10.3      | Conference papers . . . . .                   | 11        |
| 10.4      | Other published content . . . . .             | 13        |
| <b>11</b> | <b>Talks</b>                                  | <b>13</b> |
| 11.1      | Invited talks . . . . .                       | 13        |
| 11.2      | Conference presentations . . . . .            | 14        |
| <b>12</b> | <b>Software</b>                               | <b>18</b> |

## I 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) Visiting Professor, Pacific Northwest National Laboratory, Department of Energy
- (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 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   | ME360I | 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

### 4.3 Undergraduate

- Melody Lee (CS)
- Brian Ok (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

- 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: 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)
- Subrahmanyam Mullangi, CS, 2023–24. Next: Xantium Group, Tudor
- 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

- (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

- (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

- (2025) PI: Visiting Professor, DOE Pacific Northwest National Laboratory, Subcontract 802894 of DE-AC05-76RL01830, “*Quantum Simulation of Fluid Dynamics*” (\$42K)
- (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
- (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
- (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)
- (2022–26) PI: DOD ONR N00014-22-12519, “*Stochastic framework for cavitating flows: mesoscale modeling and acceleration*” (\$560K)
- (2024–25) PI: DOE DE-NA0003525 (Sandia National Laboratories subcontract), “*Vibrated bubbly flow simulation*” (\$113K)

#### 6.1.2 Completed

- (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

- (2024) PI: DOE DE-AC52-07NA27344 (Lawrence Livermore National Laboratories subcontract), “*Accelerated, Compressed, and Regularized Computation of Kinetic-based PDEs*” (\$80K)
- (2023–24) PI: DOE DE-NA0003525 (Sandia National Laboratories subcontract), “*Vibrated bubbly flow simulation*” (\$100K)
- (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
- (2022–23) PI: DOE DE-NA0003525 (Sandia National Laboratories subcontract), “*Vibrated bubbly flow simulation*” (\$65K)
- (2022–23) PI: DOE ORAU Powe, “*A methodologically coherent multi-scale model for multiphase flow*” (\$10K)
- (2022–23) co-PI: GTRI IRAD, “*Quantum optimization for lattice Boltzmann simulation (QOLBS)*” (\$40K), PI: B. Gard (Georgia Tech Research Institute)
- (2022) PI: GT Seed Grant, Forming Teams “*Quantum computing for next-generation engineering simulation*” (\$50K)
- (2022) PI: GTQA DE-00013211, “*Quantum algorithms for lattice Boltzmann fluid flow simulation*” (\$14.5K)

## 6.2 Funded resource and hardware awards

- (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)
- (2024–Present) PI: ACCESS-CI Maximize TG-PHY240200, “*Direct simulation of compressible multiphase flow*” (225K GPU Hours, 55K CPU Hours, \$119K value)
- (2024–Present) PI: ACCESS-CI Accelerate TG-PHY210084, “*High-fidelity simulation of high-flowing dispersions*” (3M ACCESS Credits, \$24K value)
- (2024–Present) PI: Jülich Supercomputing Center, JUPITER Exascale Early Access Program, “*ExaMFlow: Exascale simulation enables multiphase flow simulation at the finest scales*”
- (2021–Present) PI: Oak Ridge National Lab CFD154, Director’s Discretionary, “*Accelerated sub-grid multi-component flow physics*” (100K node hours+)
- (2021–2023) 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)
- (2024) co-PI: Georgia Tech Tech. Fee, “*Next Generation NVIDIA HPC Cluster*” (4x NVIDIA GraceHopper Superchip nodes, \$250K)
- (2022) PI: NVIDIA Academic Hardware Grant Program (4x BlueField-2 E-Series DPU, \$12K value)
- (2022) PI: Georgia Tech Tech. Fee “*ARM HPC Dev Kits for next-generation supercomputing*” (10x NVIDIA ARM HPC Dev. Kits, \$240K)
- (2022) PI: AMD MI200-series GPU Server (\$77K value)
- (2022) PI: NVIDIA Academic Hardware Grant Program (2x A100 80GB PCIe GPUs, \$30K value)
- (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

- (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   | • Multidiscipline Modeling in Materials and Structures  |
| • Applied Mathematical Modelling                                 | • Nature Communications Physics   |
| • Applied Ocean Research   | • Ocean Engineering   |
| • Computers and Fluids   | • PEARC (Practice and Experience in Advanced Research Computing)                                  |
| • Computers and Mathematics with Applications                    | • Physical Review A   |
| • Computers in Biology and Medicine                              | • Physical Review E   |
| • Computer Methods in Applied Mechanics and Engineering          | • Physical Review Fluids  |
| • Computer Standards & Interfaces                                | • Physical Review Research  |
| • European Journal of Mechanics - B/Fluids                       | • Physical Review X   |
| • Fluids   | • PLOS Computational Biology  |
| • IEEE International Parallel & Distributed Processing Symposium | • SC (International Conference for High Performance Computing, Networking, Storage, and Analysis) |
| • International Journal of Multiphase Flow                       | • SIAM Multiscale Modeling & Simulation   |
| • International Journal of Offshore and Polar Engineering        | • SIAM Scientific Computing   |
| • Journal of Computational Physics                               | • Soft Matter   |
| • Journal of Computational Science                               | • SoftwareX   |
| • Journal of Fluid Mechanics                                     | • Symposium of Naval Hydrodynamics  |
| • Measurement  | • 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

- (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)       | • (2022) Achyut Panchal (CoE AE)   |
| • (2024) Hohyun Lee (CoE ME)          | • (2022) Wangwei Lan (CoS Physics) |
| • (2023) Fatima Ezahra Chrit (CoE ME) |                                    |

#### *Ph.D. Thesis proposal*

- |  |                                   |
|--|-----------------------------------|
| • (2024) Micaiah Smith-Pierce (CoE AE) | • (2023) Liana Hatoum (CoE BME)   |
| • (2024) Sara Karamati (CoC CSE)       | • (2022) Johnie Sublett (CoC CSE) |

#### *Ph.D. Qualifying examination*

- |                                       |  |
|---------------------------------------|--|
| • (2025) Sijian Tan (CoE AE/CSE)      | • (2023) Hohyun Lee (CoE ME)           |
| • (2025) Jasrayman Thind (CoE AE/CSE) | • (2023) Grayson Harrington (CoC CSE)  |
| • (2024) Srikanth Avasarala (CoC CSE) | • (2022) Anand Radhakrishnan (CoC CSE) |
| • (2024) Benjamin Wilfong (CoC CSE)   | • (2022) Johnie Sublett (CoC CSE)      |
| • (2024) Jesus Arias (CoC CSE)        | • (2021) Bradley Baker (CoC CSE)       |
| • (2024) Lynn Jin (CoS Physics)       | • (2021) Conlain Kelly (CoC CSE)       |
| • (2024) Sijian Tan (CoE AE)          | • (2021) Sam Swanson (CoC CSE)         |
| • (2023) Ayush Jain (CoC CSE)         |  |

#### *Other*

- (2023) M.S. Thesis defense; Felix Luo (CoE AE)
- (2023) M.S. Thesis proposal; Felix Luo (CoE AE)

## 8.2 External

- (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) Shock Treatment for CFD Simulations [[LINK](#)]
  - Also propagated by: [HPCwire](#), [insideHPC](#)
- (2025) GT Supports Launch of Europe’s Fastest Supercomputer [[LINK](#)]
  - Also propagated by: [TechXplore](#), [Interesting Engineering](#)
- (2025) The OLCF’s Problem Busters [[LINK](#)]
- (2024) Featured: Art of HPC: Red Blood Cells Flowing Through a Microaneurysm Using High-Performance Computing [[LINK](#)]
- (2024) Researchers Blazing New Trails with Superchip Named After Computing Pioneer [[LINK](#)]
- (2023) GTRI, Georgia Tech Use Quantum Computing to Optimize CFD Applications [[LINK](#)]
- (2023) Group Optimizes Fluid Dynamics Simulator on World’s Fastest Supercomputer [[LINK](#)]
- (2023) Researchers Optimize HPC Software at Interdisciplinary Hackathon [[LINK](#)]
- (2022) New Hardware Brings Students Closer to Exascale Computing [[LINK](#)]
- (2022) Faculty Receives New GPUs for Fluid Dynamics and Machine Learning Research [[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](https://doi.org/10.48550/arXiv.2505.13283).



- [PP6] **Chu, T., Wilfong, B.**, Koehler, T., McMullen, R. M., Bryngelson, S. H., (2025). “Competing mechanisms at vibrated interfaces of density-stratified fluids”. arXiv:2505.23578. DOI: [10.48550/arXiv.2505.23578](https://doi.org/10.48550/arXiv.2505.23578).
- [PP5] Cisneros-Garibay, E., **Le Berre, H., Adam, D.**, Bryngelson, S. H., Freund, J. B., (2025). “Pyrometheus: Symbolic abstractions for XPU and automatically differentiated computation of combustion kinetics and thermodynamics”. arXiv:2503.24286. DOI: [10.48550/arXiv.2503.24286](https://doi.org/10.48550/arXiv.2503.24286).
- [PP4] **Song, Z.**, Ren, H., **Lee, M.**, Gard, B., Renaud, N., Bryngelson, S. H., (2025). “Reconstructing real-valued quantum states”. arXiv:2505.06455. DOI: [10.48550/arXiv.2505.06455](https://doi.org/10.48550/arXiv.2505.06455).
- [PP3] **\*Wilfong, B., \*Le Berre, H., \*Radhakrishnan, A., Gupta, A.**, 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., (2025). “MFC 5.0: An exascale many-physics flow solver”. arXiv:2503.07953, \*Equal contribution. DOI: [10.48550/arXiv.2503.07953](https://doi.org/10.48550/arXiv.2503.07953).
- [PP2] **Wilfong, B., Radhakrishnan, A., Le Berre, H.**, Tselepidis, N., Dorschner, B., Budiardja, R., Cornille, B., Abbott, S., \*Schäfer, F., \*Bryngelson, S. H., (2025). “Simulating many-engine spacecraft: Exceeding 100 trillion grid points via information geometric regularization and the MFC flow solver”. arXiv:2505.07392, \*Equal contribution. DOI: [10.48550/arXiv.2505.07392](https://doi.org/10.48550/arXiv.2505.07392).
- [PP1] 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](https://doi.org/10.48550/arXiv.2409.09217).

## 10.2 Archival, heavily refereed papers

- [P31] **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](https://doi.org/10.1016/j.future.2025.107975).
- [P30] **Chu, T.**, Estrada, J. B., Bryngelson, S. H., (2025). “Bayesian optimal design accelerates discovery of soft material properties from bubble dynamics”. *Computational Mechanics*. DOI: [10.1007/s00466-025-02606-4](https://doi.org/10.1007/s00466-025-02606-4).
- [P29] **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](https://doi.org/10.1016/j.compfluid.2024.106507).
- [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*. DOI: [10.1039/D5SM00397K](https://doi.org/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](https://doi.org/10.1016/j.cpc.2023.109052).
- [P26] \*Bryngelson, S. H., \*Schäfer, F., Liu, J., Mani, A., (2024). “Fast Macroscopic Forcing Method”. *Journal of Computational Physics* **499**. \*Equal contribution, 112721. DOI: [10.1016/j.jcp.2023.112721](https://doi.org/10.1016/j.jcp.2023.112721).
- [P25] **Kocherla, S., Song, Z., Chrit, F. E.**, Gard, B., Dumitrescu, E. F., Alexeev, A., Bryngelson, S. H., (2024). “Fully quantum algorithm for mesoscale fluid simulations with application to partial differential equations”. *AVS Quantum Science* **6**, 033806. DOI: [10.1116/5.0217675](https://doi.org/10.1116/5.0217675).

- [P24] Liu, J., Schäfer, F., Bryngelson, S. H., Zaki, T. A., Mani, A., (2024). “Adjoint-based computation of nonlocal eddy viscosity in turbulent channel flow”. *Physical Review Fluids* **9**, 094606. DOI: [10.1103/PhysRevFluids.9.094606](https://doi.org/10.1103/PhysRevFluids.9.094606).
- [P23] **Radhakrishnan, A., Le Berre, H., Wilfong, B.**, Spratt, J.-S., Rodriguez Jr. M., Colonius, T., Bryngelson, S. H., (2024). “Method for portable, scalable, and performant GPU-accelerated simulation of multiphase compressible flow”. *Computer Physics Communications* **302**, 109238. DOI: [10.1016/j.cpc.2024.109238](https://doi.org/10.1016/j.cpc.2024.109238).
- [P22] **Sinha, A.**, Bryngelson, S. H., (2024). “Neural networks can be FLOP-efficient integrators of 1D oscillatory integrands”. *Transactions on Machine Learning Research*. ISSN: 2835-8856.
- [P21] **Wilfong, B., Radhakrishnan, A., Le Berre, H. A.**, Abbott, S., Budiardja, R. D., Bryngelson, S. H., (2024). “OpenACC offloading of the MFC compressible multiphase flow solver on AMD and NVIDIA GPUs”. *SC24-W: Workshops of the International Conference for High Performance Computing, Networking, Storage and Analysis*, 1923–1933. DOI: [10.1109/SCW63240.2024.00242](https://doi.org/10.1109/SCW63240.2024.00242).
- [P20] Bryngelson, S. H., Fox, R. O., Colonius, T., (2023). “Conditional moment methods for polydisperse cavitating flows”. *Journal of Computational Physics* **477**, 111917. DOI: [10.1016/j.jcp.2023.111917](https://doi.org/10.1016/j.jcp.2023.111917).
- [P19] Elwasif, W., Bastrakov, S., Bryngelson, S. H., Bussmann, M., Chandrasekaran, S., Ciorba, F., Clark, M. A., Debus, A., Godoy, W., Hagerty, N., Hammond, J., Hardy, D., Harris, J. A., Hernandez, O., Joo, B., Keller, S., Kent, P., **Le Berre, H.**, Lebrun-Grandie, D., MacCarthy, E., Vergara, V. G. M., Messer, B., Miller, R., Oral, S., Piccinali, J.-G., **Radhakrishnan, A.**, Simsek, O., Spiga, F., Steiniger, K., Stephan, J., Stone, J. E., Trott, C., Widera, R., Young, J., (2023). “Early application experiences on a modern GPU-accelerated Arm-based HPC platform”. *HPC Asia '23. International Workshop on Arm-based HPC: Practice and Experience (IWAHPCE)*. Singapore, 35–49. DOI: [10.1145/3581576.3581621](https://doi.org/10.1145/3581576.3581621).
- [P18] Firouznia, M., Bryngelson, S. H., Saintillan, D., (2023). “A spectral boundary integral method for simulating electrohydrodynamic flows in viscous drops”. *Journal of Computational Physics* **489**, 112248. DOI: [10.1016/j.jcp.2023.112248](https://doi.org/10.1016/j.jcp.2023.112248).
- [P17] **Panchal, A.**, Bryngelson, S. H., Menon, S., (2023). “A seven-equation diffused interface method for resolved multiphase flows”. *Journal of Computational Physics* **475**, 111870. DOI: [10.1016/j.jcp.2022.111870](https://doi.org/10.1016/j.jcp.2022.111870).
- [P16] **Zeng, Q., Kothari, Y.**, Bryngelson, S. H., Schäfer, F., (2023). “Competitive physics informed networks”. *International Conference on Learning Representations (ICLR)*. arXiv:2204.11144. Kigali, Rwanda.
- [P15] Charalampopoulos, A., Bryngelson, S. H., Colonius, T., Sapsis, T. P., (2022). “Hybrid quadrature moment method for accurate and stable representation of non-Gaussian processes and their dynamics”. *Philosophical Transactions of the Royal Society A* **380** 2229. DOI: [10.1098/rsta.2021.0209](https://doi.org/10.1098/rsta.2021.0209).
- [P14] Bryngelson, S. H., Schmidmayer, K., Coralic, V., Maeda, K., Meng, J., Colonius, T., (2021). “MFC: An open-source high-order multi-component, multi-phase, and multi-scale compressible flow solver”. *Computer Physics Communications* **266**, 107396. DOI: [10.1016/j.cpc.2020.107396](https://doi.org/10.1016/j.cpc.2020.107396).
- [P13] Spratt, J.-S., Rodriguez, M., Schmidmayer, K., Bryngelson, S. H., Yang, J., Franck, C., Colonius, T., (2021). “Characterizing viscoelastic materials via ensemble-based data assimilation of bubble collapse observations”. *Journal of the Mechanics and Physics of Solids* **152**, 104455. DOI: [10.1016/j.jmps.2021.104455](https://doi.org/10.1016/j.jmps.2021.104455).
- [P12] Bryngelson, S. H., Charalampopoulos, A., Sapsis, T. P., Colonius, T., (2020). “A Gaussian moment method and its augmentation via LSTM recurrent neural networks for the statistics of cavitating bubble populations”. *International Journal of Multiphase Flow* **127**, 103262. DOI: [10.1016/j.ijmultiphaseflow.2020.103262](https://doi.org/10.1016/j.ijmultiphaseflow.2020.103262).

- [P11] Bryngelson, S. H., Colonius, T., (2020). “Simulation of humpback whale bubble-net feeding models”. *Journal of the Acoustical Society of America* **147** 2, 1126–1135. DOI: [10.1121/10.0000746](https://doi.org/10.1121/10.0000746).
- [P10] Bryngelson, S. H., Colonius, T., Fox, R. O., (2020). “QBMMlib: A library of quadrature-based moment methods”. *SoftwareX* **12**, 100615. DOI: [10.1016/j.softx.2020.100615](https://doi.org/10.1016/j.softx.2020.100615).
- [P9] Schmidmayer, K., Bryngelson, S. H., Colonius, T., (2020). “An assessment of multicomponent flow models and interface capturing schemes for spherical bubble dynamics”. *Journal of Computational Physics* **402**, 109080. DOI: [10.1016/j.jcp.2019.109080](https://doi.org/10.1016/j.jcp.2019.109080).
- [P8] Trummler, T., Bryngelson, S. H., Schmidmayer, K., Schmidt, S. J., Colonius, T., Adams, N. A., (2020). “Near-surface dynamics of a gas bubble collapsing above a crevice”. *Journal of Fluid Mechanics* **899**, A16. DOI: [10.1017/jfm.2020.432](https://doi.org/10.1017/jfm.2020.432).
- [P7] Bryngelson, S. H., Freund, J. B., (2019). “Non-modal Floquet stability of a capsule in large amplitude oscillatory extension”. *European Journal of Mechanics B/Fluids* **77**, 171–176. DOI: [10.1016/j.euromechflu.2019.04.012](https://doi.org/10.1016/j.euromechflu.2019.04.012).
- [P6] Bryngelson, S. H., Guénat, F., Freund, J. B., (2019). “Irregular dynamics of cellular blood flow in a model microvessel”. *Physical Review E* **100**, 012203. DOI: [10.1103/PhysRevE.100.012203](https://doi.org/10.1103/PhysRevE.100.012203).
- [P5] Bryngelson, S. H., Schmidmayer, K., Colonius, T., (2019). “A quantitative comparison of phase-averaged models for bubbly, cavitating flows”. *International Journal of Multiphase Flow* **115**, 137–143. DOI: [10.1016/j.ijmultiphaseflow.2019.03.028](https://doi.org/10.1016/j.ijmultiphaseflow.2019.03.028).
- [P4] Bryngelson, S. H., Freund, J. B., (2018). “Floquet stability analysis of capsules in viscous shear flow”. *Journal of Fluid Mechanics* **852**, 663–677. DOI: [10.1017/jfm.2018.574](https://doi.org/10.1017/jfm.2018.574).
- [P3] Bryngelson, S. H., Freund, J. B., (2018). “Global stability of flowing red blood cell trains”. *Physical Review Fluids* **3** 7, 073101. DOI: [10.1103/PhysRevFluids.3.073101](https://doi.org/10.1103/PhysRevFluids.3.073101).
- [P2] Bryngelson, S. H., Freund, J. B., (2016). “Buckling and its effect on the confined flow of a model capsule suspension”. *Rheologica Acta* **55** 6, 451–464. DOI: [10.1007/s00397-015-0900-9](https://doi.org/10.1007/s00397-015-0900-9).
- [P1] Bryngelson, S. H., Freund, J. B., (2016). “Capsule-train stability”. *Physical Review Fluids* **1** 3, 033201. DOI: [10.1103/PhysRevFluids.1.033201](https://doi.org/10.1103/PhysRevFluids.1.033201).

### 10.3 Conference papers

- [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](https://doi.org/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 in ill-fitting earplugs”. *AIAA Aviation Forum and ASCEND 2024*, 4391. DOI: [10.2514/6.2024-4391](https://doi.org/10.2514/6.2024-4391).
- [C15] **Le Berre, H. A., Radhakrishnan, A.,** Bryngelson, S. H., (2023). “Fast simulation of multiphase compressible flows through 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

- [O2] Bryngelson, S. H., Pantano, C., Bodony, D., Freund, J. B., (2018). *Adjoint-based sensitivity for flows with shocks*. Technical Report, XPACC.
- [OI] Bryngelson, S. H. (2017). “Stability and transition of capsule-flow systems”. Ph.D. Thesis. University of Illinois at Urbana–Champaign.

## II Talks

### II.1 Invited talks

- [I40] Acoustical Society of America, *Invited conference talk*, (2025).
- [I39] DOE Pacific Northwest National Laboratory, *Environmental Technology Seminar*, (2025).
- [I38] Georgia Tech IDEaS, *Cyberinfrastructure and Services for Science & Engineering Workshop*, (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. Naval 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+Bryngleson+-+Quantum+Computing+for+Continuum+Mechanics/1\\_23u8ou36](https://mediaspace.gatech.edu/media/CRNCH+Summit+2022+-+Spencer+Bryngleson+-+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).

## II.2 Conference presentations

- [T69] 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*.
- [T68] 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*.
- [T67] 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)*.
- [T66] 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)*.
- [T65] **Chu, T.**, Beckett, J., Abeid, B., Estrada, J. B., Bryngelson, S. H., (2025). “Bayesian optimal design accelerates discovery of material properties from bubble dynamics”. *SLAM Computational Science and Engineering*.
- [T64] **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*.

- [T63] 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)*.
- [T62] **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*.
- [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., Froklyn, 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., Colonijs, 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.**, Owahdi, 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] Colonijs, 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*.
- [T27] Rodriguez, M., Bryngelson, S. H., Colonius, T., (2022). “Numerical simulations of cavitation near an elastic object”. *ECCOMAS Congress*.
- [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  |
|-------------------------------|--|
| <a href="#">MFC</a>           | Exascale simulation of multiphase/physics fluid dynamics |
| <a href="#">MicroFC</a>       | A micro MFC and CFD mini-app                             |

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

| Name (click for Github repo.)          | Description   |
|--|---|
| <a href="#">QLBM-frugal</a>            | A resource frugal quantum lattice Boltzmann method                                      |
| <a href="#">group-docs</a>             | Group syllabus  |
| <a href="#">Quantum-HRF-Tomography</a> | Reconstructing real-valued quantum states using Hadamard Random Forest (HRF) tomography |
| <a href="#">RBC3D</a>                  | 3D Spectral boundary integral solver for cell-scale blood flow                          |
| <a href="#">MeshfreeTrixi.jl</a>       | Meshfree extension to Trixi using RBF-based numerics                                    |
| <a href="#">MeshfreeTrixiDev</a>       | Development and testing of MeshfreeTrixi.jl   |
| <a href="#">NISQ-Quantum-CFD</a>       | CFD solve on a current quantum computer   |

|   |  |
|---|--|
| <a href="#">Scientific-Visualization</a>        | Scientific visualization tutorials using Paraview              |
| <a href="#">CPINN</a>                           | Competitive Physics Informed Networks                          |
| <a href="#">fully-QLBM</a>                      | Code accompanying quantum LBM paper                            |
| <a href="#">RadialBasisFiniteDifferences.jl</a> | Library for efficient RBF-FD                                   |
| <a href="#">1d-shock-capturing-Euler</a>        | Simple shock capturing for 1D Euler eqns.                      |
| <a href="#">Quantum-PDE-Benchmark</a>           | Near-term quantum algorithm benchmarking for PDEs              |
| <a href="#">deepOscillations</a>                | Flop-efficient neural integration                              |
| <a href="#">fast-mfm</a>                        | Fast Macroscopic Forcing Method                                |
| <a href="#">awesome-numerics</a>                | Resources for learning about numerical methods.                |
| <a href="#">PyQBMMlib</a>                       | PyQBMMlib is a Python extension of QBMMlib                     |
| <a href="#">EnsAvg-1D-Tait</a>                  | 1D Ensemble-averaging solver for dilute bubbly flows           |
| <a href="#">awesome-modeling-simulation</a>     | Resources for learning about modeling and simulation           |
| <a href="#">hip-stencil-code</a>                | Stencil code for AMD GPUs                                      |
| <a href="#">RBC2D</a>                           | 2D Spectral boundary integral solver for cell-scale blood flow |
| <a href="#">QBMMlib</a>                         | Mathematica package for quadrature moment methods              |
| <a href="#">PyCav</a>                           | Dynamics of cavitating bubble populations                      |
| <a href="#">bubble-dynamics-resnet</a>          | Integrate bubble dynamics faster!                              |
| <a href="#">xacc-examples</a>                   | Misc. XACC info.   |
| <a href="#">fvm-risc</a>                        | Benchmarking FVMs on different hardware                        |

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

| <b>Name</b> (click for Github repo.)  | <b>Description</b>  |
|---------------------------------------|---|
| <a href="#">IMRv2</a>                 | IMR version 2   |
| <a href="#">IMR-RBF-BOED</a>          | Accelerated BOED via RBFs   |
| <a href="#">IMR-Bayesian-design</a>   | IMR-based Bayesian Optimal Experimental Design  |
| <a href="#">Intro-to-IMR</a>          | Simple codes to numerically simulate laser/ultrasound-induced inertial cavitation bubble dynamics in soft materials |
| <a href="#">IMR-data-assimilation</a> | IMR with Data Assimilation  |
| <a href="#">IMR-v1</a>                | Vanilla IMR codebase  |
| <a href="#">inca</a>                  | InertialCav supported by J. Estrada's group   |