

Chen Liu

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Professional experience

Jul 2021 – Present	Golomb Visiting Assistant Professor, Department of Mathematics, Purdue University, Mentor: Prof. Xiangxiong Zhang
Oct 2019 – Jul 2021	Research Geophysicist, CGG Services (U.S.) Inc.
Jul 2019 – Jun 2020	Visiting Researcher, Department of Computational and Applied Mathematics, Rice University
May 2016 – Aug 2016	Summer internship in Computation and Modeling at Shell International E&P, Inc.

Education

Rice University

May 2016 – May 2019	Ph.D. in Computational and Applied Mathematics
Aug 2014 – May 2016	M.A. in Computational and Applied Mathematics
	Advisor: Prof. Béatrice M. Rivière

Peking University

Sep 2012 – Jul 2014	M.S. in Applied Statistics
	Advisor: Prof. Hao Ge

Nankai University

Sep 2008 – Jun 2012	Double Degrees, B.S. in Pharmacy and B.S. in Information and Numerical Science
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Publications and communications

Preprints

1. **C. Liu**, B. Rivière, J. Shen, and X. Zhang (2023). “A simple and efficient convex optimization based bound-preserving high order accurate limiter for Cahn–Hilliard–Navier–Stokes system.” *Submitted*. arXiv preprint arXiv:2307.09726.
2. **C. Liu** and X. Zhang (2023). “A positivity-preserving implicit-explicit scheme with high order polynomial basis for compressible Navier–Stokes equations.” *Submitted*. arXiv preprint arXiv:2305.05769.
3. **C. Liu**, Y. Gao, and X. Zhang (2022). “Structure preserving schemes for Fokker-Planck equations of irreversible processes.” *Submitted*. arXiv preprint arXiv:2210.16628.

Journal publications

1. **C. Liu**, R. Masri, and B. Rivière (2023). “Convergence of a decoupled splitting scheme for the Cahn–Hilliard–Navier–Stokes system.” *SIAM Journal on Numerical Analysis (to appear)*. arXiv preprint arXiv:2210.05625.
2. R. Masri, **C. Liu**, and B. Rivière (2023). “Improved a priori error estimates for a discontinuous Galerkin pressure correction scheme for the Navier–Stokes equations.” *Numerical Methods for Partial Differential Equations*, 39(4), pp. 3108–3144. doi: 10.1002/num.23002.
3. R. Masri, **C. Liu**, and B. Rivière (2022). “A discontinuous Galerkin pressure correction scheme for the incompressible Navier–Stokes equations: Stability and convergence.” *Mathematics of Computation*, 91(336), pp. 1625–1654. doi: 10.1090/mcom/3731.

4. **C. Liu**, D. Ray, C. Thiele, L. Lin, and B. Rivière (2022). “A pressure-correction and bound-preserving discretization of the phase-field method for variable density two-phase flows.” *Journal of Computational Physics*, 449, p. 110769. doi: 10.1016/j.jcp.2021.110769.
5. D. Ray, **C. Liu**, and B. Rivière (2021). “A discontinuous Galerkin method for a diffuse-interface model of immiscible two-phase flows with soluble surfactant.” *Computational Geosciences*, 25(5), pp. 1775–1792. doi: 10.1007/s10596-021-10073-y.
6. **C. Liu**, F. Frank, C. Thiele, F. O. Alpak, S. Berg, W. Chapman, and B. Rivière (2020). “An efficient numerical algorithm for solving viscosity contrast Cahn–Hilliard–Navier–Stokes system in porous media.” *Journal of Computational Physics*, 400, p. 108948. doi: 10.1016/j.jcp.2019.108948.
7. **C. Liu** and B. Rivière (2020). “A priori error analysis of a discontinuous Galerkin method for Cahn–Hilliard–Navier–Stokes equations.” *CSIAM Transactions on Applied Mathematics*, 1(1), pp. 104–141. doi: 10.4208/csiam-am.2020-0005.
8. **C. Liu**, F. Frank, F. O. Alpak, and B. Rivière (2019). “An interior penalty discontinuous Galerkin approach for 3D incompressible Navier–Stokes equation for permeability estimation of porous media.” *Journal of Computational Physics*, 396, pp. 669–686. doi: 10.1016/j.jcp.2019.06.052.
9. **C. Liu**, F. Frank, and B. Rivière (2019). “Numerical error analysis for non-symmetric interior penalty discontinuous Galerkin method of Cahn–Hilliard equation.” *Numerical Methods for Partial Differential Equations*, 35(4), pp. 1509–1537. doi: 10.1002/num.22362.
10. F. Frank, **C. Liu**, A. Scanziani, F. O. Alpak, and B. Rivière (2018). “An energy-based equilibrium contact angle boundary condition on jagged surfaces for phase-field methods.” *Journal of Colloid and Interface Science*, 523, pp. 282–291. doi: 10.1016/j.jcis.2018.02.075.
11. F. Frank, **C. Liu**, F. O. Alpak, S. Berg, and B. Rivière (2018). “Direct numerical simulation of flow on pore-scale images using the phase-field method.” *SPE Journal*, 23(5), pp. 1833–1850. doi: 10.2118/182607-PA.
12. F. Frank, **C. Liu**, F. O. Alpak, and B. Rivière (2018). “A finite volume/discontinuous Galerkin method for the advective Cahn–Hilliard equation with degenerate mobility on porous domains stemming from micro-CT imaging.” *Computational Geosciences*, 22(2), pp. 543–563. doi: 10.1007/s10596-017-9709-1.

Conference proceedings

1. F. Frank, **C. Liu**, F. O. Alpak, M. Araya-Polo, and B. Rivière (2017). “A discontinuous Galerkin finite element framework for the direct numerical simulation of flow on high-resolution pore-scale images.” *SPE Reservoir Simulation Conference*. Society of Petroleum Engineers. doi: 10.2118/182607-MS.

Theses

- C. Liu** (2019). “Discontinuous Galerkin methods for pore-scale multiphase flow: theoretical analysis and simulation.” PhD thesis. Rice University.
- C. Liu** (2016). “Pore-scale simulation of fluid flow using discontinuous Galerkin methods.” MA thesis. Rice University.
- C. Liu** (2014). “Coarse-grained model for studying DNA mediated allosteric phenomenon.” MA thesis. Peking University.

Talks and presentations

1. Mini-symposium talk, AMS Fall Eastern Sectional Meeting. University at Buffalo (SUNY), Buffalo, NY. Sep 09, 2023 (upcoming).

2. Mini-symposium talk, 17th U.S. National Congress on Computational Mechanics. Albuquerque, NM. July 23, 2023 (upcoming).
3. Mini-symposium talk, AMS Spring Central Sectional Meeting. University of Cincinnati, Cincinnati, OH. Apr 15, 2023.
4. Talk, Finite Element Rodeo, Texas A&M University, College Station, TX. Mar 24, 2023.
5. CCAM seminar, Purdue University, West Lafayette, IN. Jan 30, 2023.
6. Mini-symposium talk, The 7th Annual Meeting of SIAM Central States Section. Oklahoma State University, Stillwater, OK. Oct 01, 2022.
7. Mini-symposium talk, 2022 SIAM Great Lakes Section Annual Meeting. Wayne State University, Detroit, MI. Sep 24, 2022.
8. Mini-symposium talk, AMS Spring Central Sectional Meeting. Purdue University, West Lafayette, IN. Mar 27, 2022.
9. Mini-symposium talk, SIAM Conference on Mathematical & Computational Issues in the Geosciences, Houston, TX. Mar 13, 2019.
10. Poster presentation, Oil & Gas HPC Conference, Houston, TX. Mar 06, 2019.
11. Talk, Finite Element Rodeo, UT Austin, Austin, TX. Mar 01, 2019.
12. Talk, SCALA 2019: Scientific Computing Around Louisiana, Tulane University, New Orleans, LA. Feb 16, 2019.
13. Mini-symposium talk, InterPore 10th Annual Meeting and Jubilee Conference, New Orleans, LA. May 16, 2018.
14. Poster presentation, Offshore Technology Conference, Houston, TX. May 03, 2018.
15. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 13, 2018.
16. Talk, Finite Element Rodeo, Louisiana State University, Baton Rouge, LA. Feb 23, 2018.
17. Mini-symposium talk, Texas Applied Mathematics and Engineering Symposium, UT Austin, Austin, TX. Sep 22, 2017.
18. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 16, 2017.
19. Talk, Finite Element Rodeo, Houston University, Houston, TX. Mar 03, 2017.
20. Talk, Finite Element Rodeo, Texas A&M University, College Station, TX. Mar 05, 2016.
21. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 03, 2016.

Workshops participation

June 13, 2022 – June 14, 2022	Broadening Participation: 2022 Mathematical and Physical Sciences (MPS Workshop) for Young Investigators. Alexandria, VA.
Apr 20, 2017 – Apr 21, 2017	Digital Rock Project Workshop on Pore-Scale Flow Simulation – Integration of Simulation, Experimentation, and Imaging Processes. Houston, TX.

Teaching experience

Purdue University

Aug 2023 – Dec 2023	Instructor for MA 30300 Differential Equations and Partial Differential Equations for Engineering and the Sciences
Jan 2023 – May 2023	Instructor for MA 26600 Ordinary Differential Equations
Aug 2022 – Dec 2022	Instructor for MA 30300 Differential Equations and Partial Differential Equations for Engineering and the Sciences
Jan 2022 – May 2022	Instructor for MA 26600 Ordinary Differential Equations
Aug 2021 – Dec 2021	Instructor for MA 26600 Ordinary Differential Equations

Rice University

Jan 2018 – May 2018	Teaching assistant for CAAM 335 Matrix Analysis
Aug 2016 – Dec 2016	Teaching assistant for CAAM 335 Matrix Analysis

Peking University

Feb 2014 – Jun 2014	Teaching assistant for Clinical Trial Design and Analysis
Sep 2013 – Jan 2014	Teaching assistant for Probability and Statistics (B)

Professional service

Co-organizer of workshops and conference mini-symposiums

March 2022	with Xiangxiong Zhang, <i>Special Session on Recent Progress of Efficient and Robust Schemes for Compressible Navier–Stokes Equations</i> , AMS Spring Central Sectional Meeting, Purdue University, West Lafayette, IN.
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Referee for journals/proceedings

- Applied Mathematics and Computation
- Communications in Computational Physics
- Computational Geosciences
- Computers and Fluids
- ESAIM: Mathematical Modelling and Numerical Analysis (M2AN)
- Journal of Computational and Applied Mathematics
- Journal of Computational Physics
- Journal of Scientific Computing
- SIAM Journal on Numerical Analysis
- SIAM Journal on Scientific Computing

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