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

Publications and communications

Preprints and in preparation

1. **C. Liu** and X. Zhang (2022). "An invariant domain preserving explicit–implicit scheme for compressible Navier–Stokes equations." *In preparation*.

2. **C. Liu**, Y. Gao, and X. Zhang (2022). "Structure preserving higher order scheme for Fokker-Planck equation for irreversible process." *In preparation*.

3. **C. Liu**, R. Masri, and B. Rivière (2022). "Convergence of a decoupled splitting scheme for the Cahn–Hilliard–Navier–Stokes system." *In preparation*.

4. R. Masri, **C. Liu**, and B. Rivière (2021). "Improved a priori error estimates for a discontinuous Galerkin pressure correction scheme for the Navier–Stokes equations." *Submitted*. arXiv preprint arXiv:2112.03903.

Journal publications

1. 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.

2. **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.

3. 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.

4. **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.

5. **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.

6. **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.

7. **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.

8. 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.

9. 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.

10. 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 Spring Central Sectional Meeting. Purdue University, West Lafayette, IN. Mar 27, 2022.

2. Mini-symposium talk, SIAM Conference on Mathematical & Computational Issues in the Geosciences, Houston, TX. Mar 13, 2019.

3. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 06, 2019.

4. Talk, Finite Element Rodeo, UT Austin, Austin, TX. Mar 01, 2019.

5. Mini-symposium talk, SCALA 2019: Scientific Computing Around Louisiana, Tulane University, New Orleans, LA. Feb 16, 2019.

6. Mini-symposium talk, InterPore 10th Annual Meeting and Jubilee Conference, New Orleans, LA. May 16, 2018.

7. Poster presentation, Offshore Technology Conference, Houston, TX. May 03, 2018.

8. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 13, 2018.
9. Talk, Finite Element Rodeo, Louisiana State University, Baton Rouge, LA. Feb 23, 2018.
10. Mini-symposium talk, Texas Applied Mathematics and Engineering Symposium, UT Austin, Austin, TX. Sep 22, 2017.
11. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 16, 2017.
12. Talk, Finite Element Rodeo, Houston University, Houston, TX. Mar 03, 2017.
13. Talk, Finite Element Rodeo, Texas A&M University, College Station, TX. Mar 05, 2016.
14. 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 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, *Special Session on Recent Progress of Efficient and Robust Schemes for Compressible Navier–Stokes Equations*, AMS Spring Central Sectional Meeting. Purdue University, West Lafayette, IN.

Referee for journals/proceedings

- Applied Mathematics and Computation
- Communications in Computational Physics
- Computers and Fluids
- Journal of Computational and Applied Mathematics
- Journal of Computational Physics
- SIAM Journal on Numerical Analysis
- SIAM Journal on Scientific Computing