Chen Liu

850 West Dickson Street,
Fayetteville, Arkansas 72701
Email: chenl@uark.edu
URL: https://cl59.github.io

Professional experience

Aug 2024 – Present	Assistant Professor, Department of Mathematical Sciences, University of Arkansas
Jul 2021 – Aug 2024	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

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. Beatrice Riviere

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

1. **C. Liu**, Z. Sun, and X. Zhang (2024). "A bound-preserving Runge–Kutta discontinuous Galerkin method with compact stencils for hyperbolic conservation laws." *Submitted*. arXiv:2412.16002.

2. **C. Liu**, J. Hu, W. T. Taitano, and X. Zhang (2024). "An optimization-based positivity-preserving limiter in semi-implicit discontinuous Galerkin schemes solving Fokker–Planck equations." *Submitted*. arXiv:2410.19143.

Journal publications

1. **C. Liu**, G. T. Buzzard, and X. Zhang (2024). "An optimization based limiter for enforcing positivity in a semi-implicit discontinuous Galerkin scheme for compressible Navier–Stokes equations." *Journal of Computational Physics*, 519, p. 113440. DOI: 10.1016/j.jcp.2024.113440.

2. **C. Liu**, B. Riviere, J. Shen, and X. Zhang (2024). "A simple and efficient convex optimization based bound-preserving high order accurate limiter for Cahn–Hilliard–Navier–Stokes system." *SIAM Journal on Scientific Computing*, 46(3), A1923–A1948. DOI: 10.1137/23M1587853.

3. **C. Liu**, Y. Gao, and X. Zhang (2024). "Structure preserving schemes for Fokker–Planck equations of irreversible processes." *Journal of Scientific Computing*, 98(1), p. 4. DOI: 10.1007/s10915-023-02378-0.

4. **C. Liu**, R. Masri, and B. Riviere (2023). "Convergence of a decoupled splitting scheme for the Cahn–Hilliard–Navier–Stokes system." *SIAM Journal on Numerical Analysis*, 61(6), pp. 2651–2694. DOI: 10.1137/22M1528069.

5. **C. Liu** and X. Zhang (2023). "A positivity-preserving implicit-explicit scheme with high order polynomial basis for compressible Navier–Stokes equations." *Journal of Computational Physics*, 493, p. 112496. DOI: 10.1016/j.jcp.2023.112496.

6. R. Masri, **C. Liu**, and B. Riviere (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.

7. R. Masri, **C. Liu**, and B. Riviere (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.

8. **C. Liu**, D. Ray, C. Thiele, L. Lin, and B. Riviere (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.

9. D. Ray, **C. Liu**, and B. Riviere (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.

10. **C. Liu**, F. Frank, C. Thiele, F. O. Alpak, S. Berg, W. Chapman, and B. Riviere (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.

11. **C. Liu** and B. Riviere (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.

12. **C. Liu**, F. Frank, F. O. Alpak, and B. Riviere (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.

13. **C. Liu**, F. Frank, and B. Riviere (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.

14. F. Frank, **C. Liu**, A. Scanziani, F. O. Alpak, and B. Riviere (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.

15. F. Frank, **C. Liu**, F. O. Alpak, S. Berg, and B. Riviere (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.

16. F. Frank, **C. Liu**, F. O. Alpak, and B. Riviere (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. Riviere (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. (upcoming) Mini-symposium talk, SIAM Conference on Computational Science and Engineering (CSE25), Fort Worth, TX. Mar 03, 2025
2. Mini-symposium talk, The 9th Annual Meeting of SIAM Central States Section, University of Missouri-Kansas City, Kansas City, MO. Oct 05, 2024.
3. Applied Mathematics Seminar talk, Department of Mathematical Sciences, University of Arkansas, Fayetteville, AR. Sep 06, 2024.
4. Talk, Finite Element Rodeo, Rice University, Houston, TX. Mar 08, 2024.
5. Colloquium talk (virtual), Department of Mathematical Sciences, University of Arkansas, Fayetteville, AR. Jan 31, 2024.
6. Colloquium talk, Department of Mathematical Sciences, New Jersey Institute of Technology, Newark, NJ. Jan 26, 2024.
7. Mini-symposium talk, The 6th SIAM Texas-Louisiana Sectional Meeting (SIAM TX-LA 2023). University of Louisiana at Lafayette, Lafayette, LA. Nov 05, 2023.
8. Talk, Finite Element Circus, University of Notre Dame, South Bend, IN. Oct 20, 2023.
9. Colloquium talk, Department of Mathematics and Statistics, Oakland University, Rochester, MI. Oct 10, 2023.
10. Mini-symposium talk, AMS Fall Eastern Sectional Meeting. University at Buffalo (SUNY), Buffalo, NY. Sep 09, 2023.
11. Mini-symposium talk, 17th U.S. National Congress on Computational Mechanics. Albuquerque, NM. July 23, 2023.
12. Mini-symposium talk, AMS Spring Central Sectional Meeting. University of Cincinnati, Cincinnati, OH. Apr 15, 2023.
13. Talk, Finite Element Rodeo, Texas A&M University, College Station, TX. Mar 24, 2023.
14. CCAM seminar talk, Purdue University, West Lafayette, IN. Jan 30, 2023.
15. Mini-symposium talk, The 7th Annual Meeting of SIAM Central States Section. Oklahoma State University, Stillwater, OK. Oct 01, 2022.
16. Mini-symposium talk, 2022 SIAM Great Lakes Section Annual Meeting. Wayne State University, Detroit, MI. Sep 24, 2022.
17. Mini-symposium talk, AMS Spring Central Sectional Meeting. Purdue University, West Lafayette, IN. Mar 27, 2022.
18. Mini-symposium talk, SIAM Conference on Mathematical & Computational Issues in the Geosciences, Houston, TX. Mar 13, 2019.
19. Poster presentation, Oil & Gas HPC Conference, Houston, TX. Mar 06, 2019.
20. Talk, Finite Element Rodeo, UT Austin, Austin, TX. Mar 01, 2019.
21. Talk, SCALA 2019: Scientific Computing Around Louisiana, Tulane University, New Orleans, LA. Feb 16, 2019.
22. Mini-symposium talk, InterPore 10th Annual Meeting and Jubilee Conference, New Orleans, LA. May 16, 2018.

23. Poster presentation, Offshore Technology Conference, Houston, TX. May 03, 2018.
24. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 13, 2018.
25. Talk, Finite Element Rodeo, Louisiana State University, Baton Rouge, LA. Feb 23, 2018.
26. Mini-symposium talk, Texas Applied Mathematics and Engineering Symposium, UT Austin, Austin, TX. Sep 22, 2017.
27. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 16, 2017.
28. Talk, Finite Element Rodeo, Houston University, Houston, TX. Mar 03, 2017.
29. Talk, Finite Element Rodeo, Texas A&M University, College Station, TX. Mar 05, 2016.
30. Poster presentation, Oil & Gas HPC Conference, Houston. Mar 03, 2016.

Workshops participation

Oct 03, 2024 – Oct 04, 2024	BRING MATH (Bridges for the Next Generation: Mathematical Science Research and Our Future). Argonne National Laboratory, Lemont, IL.
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

University of Arkansas (Instructor)

- MATH/PHYS 53603 Scientific Computation and Numerical Methods, Fall 2024
- MATH 30803 Linear Algebra, Spring 2025

Purdue University (Instructor)

- MA 30300 Differential Equations and Partial Differential Equations for Engineering and the Sciences, Summer 2024, Spring 2024, Fall 2023, Fall 2022
- MA 26600 Ordinary Differential Equations, Spring 2023, Spring 2022, Fall 2021

Rice University (Teaching Assistant)

- CAAM 335 Matrix Analysis, Spring 2018, Fall 2016

Peking University (Teaching Assistant)

- Clinical Trial Design and Analysis, Spring 2014
- Probability and Statistics (B), Fall 2013

Professional service

Departmental service

- Organizer of the Applied Mathematics Seminar at University of Arkansas, Fall 2024 – Present.

Conferences, workshops, and mini-symposiums organized

- With Zheng Sun, *Special Session on Recent Advances in Numerical Algorithms for Computational Fluid Dynamics*, the 9th Annual Meeting of SIAM Central States Section. University of Missouri-Kansas City, Kansas City, MO., Oct 2024.
- 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., Mar 2022.

Referee for journals/proceedings

- Applied Mathematics and Computation
- Applied Mathematical Modelling
- Applied Numerical Mathematics
- Calcolo
- Communications in Computational Physics
- Communications in Nonlinear Science and Numerical Simulation
- 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
- Mathematical Modelling and Analysis
- Numerical Methods for Partial Differential Equations
- SIAM Journal on Numerical Analysis
- SIAM Journal on Scientific Computing