Ziyao Xu

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Room B17, Hayes-Healy Hall
Department of Applied and Computational
Mathematics and Statistics (ACMS)
University of Notre Dame

Education

- **Brown University** — Providence, RI, USA
  Ph.D. in Applied Mathematics. Advisor: Chi-Wang Shu. — *Sep. 2019 – May. 2023*
- **Michigan Technological University** — Houghton, MI, USA
  M.S. in Mathematical Sciences. Advisor: Yang Yang. — *Jan. 2017 – May. 2019*
- **China University of Petroleum (East China)** — Qingdao, Shandong, China
  B.E. in Petroleum Engineering. — *Sep. 2012 – Jun. 2016*

Professional Experiences

- **University of Notre Dame** — Notre Dame, IN, USA
  Robert and Sara Lumpkins Postdoctoral Research Associate. — *Jul. 2023 – Present*

Research Interests

- Discontinuous Galerkin, ENO/WENO
- Hyperbolic Conservation Laws
- Flow and Transport in Porous Media

Publications and Preprints

- Ziyao Xu and Chi-Wang Shu, *A high-order well-balanced discontinuous Galerkin method for hyperbolic balance laws based on the Gauss-Lobatto quadrature rules*, submitted.
- Ziyao Xu and Chi-Wang Shu, *A high-order well-balanced alternative finite difference WENO (A-WENO) method with the exact conservation property for systems of hyperbolic balance laws*, submitted.
- Ziyao Xu and Chi-Wang Shu, *Local characteristic decomposition free high order finite difference WENO schemes for hyperbolic systems endowed with a coordinate system of Riemann invariants*, submitted.
- Xinyu Wu, Hui Guo, Ziyao Xu and Yang Yang, *A reinterpreted discrete fracture model for Darcy-Forchheimer flow in fractured porous media*, Advances in Water Resources, (2023), 104504.
- Ziyao Xu and Chi-Wang Shu, *On the conservation property of positivity-preserving discontinuous Galerkin methods for stationary hyperbolic equations*, Journal of Computational Physics, v490 (2023), 112304.
- Ziyao Xu and Yang Yang, *The hybrid-dimensional Darcy's law: A non-conforming reinterpreted discrete fracture model (RDFM) for the compressible miscible displacement and multicomponent gas flow in fractured media*, Paper presented at the SPE Reservoir Simulation Conference, (2023), SPE-212164-MS.
- Ziyao Xu, Zhaoqin Huang and Yang Yang, *The hybrid-dimensional Darcy's law: A non-conforming reinterpreted discrete fracture model (RDFM) for single-phase flow in fractured media*, Journal of Computational Physics, v473 (2022), 111749.
- Ziyao Xu and Chi-Wang Shu, *Third order maximum-principle-satisfying and positivity-preserving Lax-Wendroff discontinuous Galerkin methods for hyperbolic conservation laws*, Journal of Computational Physics, v470 (2022), 111591.
- Ziyao Xu and Chi-Wang Shu, *High order conservative positivity-preserving discontinuous Galerkin method for stationary hyperbolic equations*, Journal of Computational Physics, v466 (2022), 111410.

- Hui Guo, Wenjing Feng, Ziyao Xu and Yang Yang, *Conservative numerical methods for the reinterpreted discrete fracture model on non-conforming meshes and their applications in contaminant transportation in fractured porous media*, Advances in Water Resources, v153 (2021), 103951.

- Ziyao Xu and Yang Yang, *The hybrid dimensional representation of permeability tensor: A reinterpretation of the discrete fracture model and its extension on nonconforming meshes*, Journal of Computational Physics, v415(2020), 109523.

- Ziyao Xu, Yang Yang and Hui Guo, *High-order bound-preserving discontinuous Galerkin methods for wormhole propagation on triangular meshes*, Journal of Computational Physics, v390 (2019), pp.323-341.

- Nattaporn Chuenjarern, Ziyao Xu and Yang Yang, *High-order bound-preserving discontinuous Galerkin methods for compressible miscible displacements in porous media on triangular meshes*, Journal of Computational Physics,v378 (2019), pp.110-128.

- Hui Guo, Lulu Tian, Ziyao Xu, Yang Yang and Ning Qi, *High-order local discontinuous Galerkin method for simulating wormhole propagation*, Journal of Computational and Applied Mathematics, v350 (2019), pp.247-261.

Conference Presentations

- SPE Reservoir Simulation Conference, Galveston, Texas, USA, March 28-30, 2023.
  Poster: The Hybrid-Dimensional Darcy's Law: A Non-Conforming Reinterpreted Discrete Fracture Model (RDFM) for the Compressible Miscible Displacement and Multicomponent Gas Flow in Fractured Media.

- CSCDR Seminar, Umass Dartmouth, North Dartmouth, MA, October 19, 2022.
  Presentation: On the Conservation and Lax-Wendroff Theorem of Positivity-preserving Discontinuous Galerkin Methods for Stationary Hyperbolic Equations.

- 2022 SIAM Annual Meeting, July 11-15, 2022. Co-organizer of MS8, MS23, MS49: Recent Advances in Computational Geosciences.
  Presentation: A Reinterpreted Discrete Fracture Model for Fracture and Barrier Networks on Non-Conforming Meshes.

- Copper Country Workshop on Applied Mathematics, Statistics, and Data Sciences, Michigan Technologycal University, Houghton, MI, July 5-7, 2022.
  Presentation: High Order Conservative Positivity-Preserving Discontinuous Galerkin Method for Stationary Hyperbolic Equations.

- 2021 SIAM Annual Meeting, July 19-24, 2021. Organizer of MS9: Models and Numerical Methods in Computational Geosciences.
  Presentation: The Hybrid-Dimensional Darcy's Law: A Novel Discrete Fracture Model for Fracture and Barrier Networks on Non-Conforming Meshes.

- 2021 SIAM Conference on Mathematical & Computational Issues in the Geosciences, June 21-24, 2021.
  Presentation: The Hybrid-Dimensional Representation of Permeability Tensor: A Reinterpretation of the Discrete Fracture Model and its Extension on Nonconforming Meshes.

- 2019 SIAM Conference on Computational Science and Engineering, Spokane Convention Center, Spokane, WA, February 25 - March 1, 2019. Organizer of MS329: Recent Advances in Discontinuous Galerkin Methods for Partial Differential Equations.
  Presentation: High-Order Bound-Preserving Discontinuous Galerkin Method for Wormhole Propagation Model.

- 2018 SIAM Great Lakes Section Annual Meeting, Wayne State University, Detroit, MI, April 21, 2018.
  Presentation: High-Order Bound-Preserving Discontinuous Galerkin Methods for Compressible Miscible Displacements in Porous Media on Triangular Meshes.

Teaching Experience

- APMA 0350 Applied Ordinary Differential Equations, Teaching Assistant, Brown University, Spring 2021
- APMA 1170 Introduction to Computational Linear Algebra, Teaching Assistant, Brown University, Fall 2020
- MA 2160 Calculus 2, Instructor, Michigan Technological University, Spring 2019
- MA 1135 Calculus for Life Sciences, Instructor, Michigan Technological University, Fall 2018
- MA 2160 Calculus 2, Instructor, Michigan Technological University, Spring 2018

Honors & awards

- David Gottlieb Memorial Award, Division of Applied Mathematics, Brown University, 2023.
- Outstanding Research Award, Department of Mathematical Sciences, Michigan Technological University, 2019
- The First Prize Scholarship, China University of Petroleum, 2015
- National Scholarship, China, 2013, 2014

Skills

- Programming: Matlab, Julia, Python, C, Latex