Zheng SUN

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Education

- **Brown University, RI, USA**

  Ph.D. in Applied Mathematics, Division of Applied Mathematics. 08/2014 – 05/2018
  Advisor: Prof. Chi-Wang Shu.

  M.Sc. in Applied Mathematics, Division of Applied Mathematics. 08/2014 – 05/2015

- **University of Science and Technology of China, Anhui, China**

  B.Sc. in Mathematics and Applied Mathematics, 09/2010 – 07/2014
  School of the Gifted Young.
  Advisor: Prof. Falai Chen.

Professional Experience

- **The University of Alabama, AL, USA**

  Assistant Professor, Department of Mathematics. 08/2021 – Present

- **The Ohio State University, OH, USA**

  Visiting Assistant Professor, Department of Mathematics. 08/2018 – 08/2021
  Mentor: Prof. Yulong Xing.

- **Oak Ridge National Laboratory, TN, USA**

  Intern, Computer Science and Mathematics Division. Summers, 2017 & 2018
  Mentor: Dr. Cory Hauck.

Honors and Awards

- SIAM Early Career Travel Award. 2019 & 2021
- New World Mathematics Award, Honorable Mention of Doctoral Thesis. 2018
- David Gottlieb Memorial Award, Brown University. 2018
- NSF Mathematical Sciences Graduate Internship. 2017
- China National Scholarship. 2011, 2012 & 2013

Research Grant

- Sole PI: NSF DMS-2208391 ($158,030) 08/2022 – 07/2025
  Runge-Kutta Discontinuous Galerkin Methods for Convection-Dominated Systems with Compact Stencils, National Science Foundation, Division of Mathematical Sciences.

Publications

Preprints

2. M. Peng, Z. Sun and K. Wu, OEDG: Oscillation-eliminating discontinuous Galerkin method for hyperbolic conservation laws, submitted for publication.
1. Z. Sun and Y. Xing, On a numerical artifact of solving shallow water equations with a discontinuous bottom: Analysis and a nontransonic fix, submitted for publication.

Publications in Refereed Journal (Appeared or Accepted)

15. Q. Chen, Z. Sun and Y. Xing, The Runge—Kutta discontinuous Galerkin method with compact stencils for hyperbolic conservation laws, *SIAM Journal on Scientific Computing*, to appear.
14. J. Hunter, Z. Sun and Y. Xing, Stability and time-step constraints of implicit-explicit Runge–Kutta methods for the linearized Korteweg–de Vries equation, *Communications on Applied Mathematics and Computation*, to appear.
13. Z. Sun and Y. Xing, On generalized Gauss–Radau projections and optimal error estimates of upwind-biased DG methods for the linear advection equation on special simplex meshes, *Journal of Scientific Computing*, v95 (2023), 40.
12. J. Gopalakrishnan and Z. Sun, Stability of structure-aware Taylor methods for tents, *Mathematics of Computation*, v92 (2023), pp.1061–1086.
11. Z. Sun, Y. Wei and K. Wu, On energy laws and stability of Runge–Kutta methods for linear seminegative problems, *SIAM Journal on Numerical Analysis*, v60 (2022), pp.2448-2481.
10. Z. Sun and C.-W. Shu, Enforcing strong stability of explicit Runge–Kutta methods with superviscosity, *Communications on Applied Mathematics and Computation*, v3 (2021), pp.671–700.
9. Z. Sun, S. Wang, L.-B. Chang, Y. Xing and D. Xiu, Convolution neural network shock detector for numerical solution of conservation laws, *Communications in Computational Physics*, v28 (2020), pp.2075–2108.
8. Z. Sun and Y. Xing, Optimal error estimates of discontinuous Galerkin methods with generalized fluxes for wave equations on unstructured meshes, *Mathematics of Computation*, v90 (2021), pp.1741–1772.
7. Z. Sun and Y. Xing, On structure-preserving discontinuous Galerkin methods for Hamiltonian partial differential equations: Energy conservation and multi-symplecticity, *Journal of Computational Physics*, v419 (2020), 109662.
6. Z. Sun and C.D. Hauck, Low-memory, discrete ordinates, discontinuous Galerkin methods for radiative transport, *SIAM Journal on Scientific Computing*, v42 (2020), pp.B869–B893.
5. Z. Sun and C.-W. Shu, Strong stability of explicit Runge–Kutta time discretizations, *SIAM Journal on Numerical Analysis*, v57 (2019), pp.1158–1182.

4. Z. Sun, J.A. Carrillo and C.-W. Shu, An entropy stable high-order discontinuous Galerkin method for cross-diffusion gradient flow systems, *Kinetic and Related Models*, v12 (2019), pp.885–908.
3. Z. Sun, J.A. Carrillo and C.-W. Shu, A discontinuous Galerkin method for nonlinear parabolic equations and gradient flow problems with interaction potentials, *Journal of Computational Physics*, v352 (2018), pp.76–104.
2. Z. Sun and C.-W. Shu, Stability of the fourth order Runge–Kutta method for time-dependent partial differential equations, *Annals of Mathematical Sciences and Applications*, v2 (2017), pp.255–284.
1. Z. Sun and C.-W. Shu, Stability analysis and error estimates of Lax–Wendroff discontinuous Galerkin methods for linear conservation laws, *ESAIM: Mathematical Modelling and Numerical Analysis*, v51 (2017), pp.1063–1087.

Technical Report

1. Z. Sun and C.-W. Shu, Error analysis of Runge–Kutta discontinuous Galerkin methods for linear time-dependent partial differential equations. `https://arxiv.org/abs/2001.00971`

Talks and Presentations

Invited Talks at Department Seminars/Colloquia

16. Applied and Computational Math Seminar, Department of Mathematics, Auburn University, AL, 01/19/2024.
15. ACMS Applied Math Seminar, Department of Applied and Computational Mathematics and Statistics, University of Notre Dame, Notre Dame, IN, 05/04/2023.
14. Computational Math Seminar, Department of Mathematics, The Ohio State University, Columbus, OH, 04/18/2023.
13. Mathematics Seminar, Department of Mathematics and Statistics, Mississippi State University, Starkville, MS, 09/02/2022.
12. Applied and Computational Mathematics Seminar, Fariborz Maseeh Mathematics and Statistics, Portland State University, Portland, OR, 05/27/2022.
11. Applied Math Seminar, Department of Mathematics, Texas Tech University, online, 03/30/2022.
10. PDE and Applied Math Seminar, Department of Mathematics, University of California, Riverside, online, 02/23/2022.
9. Colloquium, Department of Mathematical Sciences, Florida Institute of Technology, online, 03/18/2021.
8. CAM Seminar, Computer Science and Mathematics Division, Oak Ridge National Laboratory, online, 03/11/2021.
7. Seminar, School of Mathematical Sciences and Statistics, University of Texas Rio Grande Valley, online, 03/10/2021.
6. Colloquium, Department of Mathematics, The University of Alabama, online, 01/26/2021.
5. Seminar, Department of Mathematical Sciences, Michigan Technological University, online, 12/07/2020.

4. Seminar, Department of Mathematics, National University of Singapore, online, 12/01/2020.
3. Seminar, Mathematics Department, Western Connecticut State University, online, 11/15/2020.
2. Seminar, Department of Mathematical Sciences, Korea Advanced Institute of Science and Technology, online, 10/14/2020.
1. CAM Seminar, Computer Science and Mathematics Division, Oak Ridge National Laboratory, Oak Ridge, TN, 06/27/2019.

Invited Talks at Conference Minisymposia

16. Minisymposium on *Recent Advances in Discontinuous Galerkin Methods in Computational Fluid Dynamics,* organized by Ziyao Xu, 8th Annual Meeting of SIAM Central States Section, 10/07/2023.
15. Minisymposium on *Advances in Numerical Methods for Partial Differential Equations and Applications,* organized by Xiaoming He and Xu Zhang, 8th Annual Meeting of SIAM Central States Section, 10/07/2023.
14. Minisymposium on *Special Session on Recent Advances in Numerical Methods for Fluid Dynamics and Their Applications,* organized by Guosheng Fu, Daozhi Han, and Jia Zhao, AMS Fall Eastern Sectional Meeting, Buffalo, NY, 09/09/2023.
13. Minisymposium on *Modern Trends in Numerical PDEs,* organized by Johnny Guzman and Michael Neilan, AMS Spring Central Sectional Meeting, Cincinnati, OH, 04/15/2023.
12. Minisymposium on *Recent Developments in High-Order Numerical Methods for Partial Differential Equations,* organized by Juntao Huang and Zheng Sun, 5th Annual Meeting of the SIAM Texas-Louisiana Section, Houston, TX, 11/06/2022.
11. Minisymposium on *Recent Advances in Numerical Algorithms for Partial Differential Equations and Applications,* organized by Ruchi Guo, Zhuang Qiao, and Xu Zhang, 7th Annual Meeting of the SIAM Central States Section, Stillwater, OK, 10/01/2022.
10. Minisymposium on *Moment Closures and Computational Methods for Kinetic Models,* organized by Juntao Huang, 2022 SIAM Annual Meeting, online, 07/12/2022.
9. Minisymposium on *Recent Developments in High Order Numerical Methods for Partial Differential Equations,* organized by Zheng Sun and Xiangxiong Zhang, AMS Spring Central Sectional Meeting, online, 03/26/2022.
8. Minisymposium on *Advances in Memory Efficient Numerical Algorithms for Kinetic Problems*, organized by Stefan Schnake, SIAM Southeastern Atlantic Section Meeting, Auburn, AL, 09/18/2021.
7. Minisymposium on *Modeling and Numerical Methods for Coupled PDE Systems*, organized by Xiaoming He and Xiaofeng Yang, SIAM Southeastern Atlantic Section Meeting, Auburn, AL, 09/18/2021.
6. Minisymposium on *Recent Advances on Discontinuous Galerkin Finite Element Methods: Analysis and Computation*, organized by Zheng Sun and Yulong Xing, online, 03/04/2021.
5. Minisymposium on *Stable and Efficient Time Integration Schemes for Conservation Laws and Related Models*, organized by Philip Öffner and Hendrik Ranocha, online, 07/09/2020.
4. Minisymposium on *Structure Preserving Numerical Methods for Gradient Flow Equations*, organized by Jingwei Hu and Erlend S. Riis, 2019 SIAM Conference on Analysis of Partial Differential Equations, La Quinta, CA, 12/11/2019.

3. Minisymposium on *Recent Developments of Discontinuous Galerkin Finite Element Methods*, organized by Jue Yan and Yang Yang, 2019 SIAM Central States Section Meeting, Ames, IA, 10/19/2019.
2. Minisymposium on *Recent Advances in Discontinuous Galerkin Methods for Partial Differential Equations*, organized by Ziyao Xu, 2019 SIAM Conference on Computational Science and Engineering, Spokane, WA, 02/28/2019.
1. Minisymposium on *Recent Advances in Finite Element Methods for Partial Differential Equations*, organized by Yukun Li and Yulong Xing, 2018 AMS Spring Central Sectional Meeting, Columbus, OH, 03/17/2018.

Contributed Talks

5. 2022 Spring Finite Element Circus, online, 04/09/2022.
4. 2021 SIAM Great Lakes Section Meeting, online, 04/23/2021.
3. 2021 Spring Finite Element Circus, online, 04/09/2021.
2. 2019 SIAM Great Lakes Section Meeting, Ann Arbor, MI, 04/27/2019.
1. 2019 Spring Finite Element Circus, West Lafayette, IN, 03/22/2019.

Other Presentations

5. Poster Presentation, Los Alamos Workshop on Time Integration for Multiphysics (T$\bar{\text{I}}$M 2023), Los Alamos, NM, 08/09/2023.
4. Applied Math Seminar, Department of Mathematics, The University of Alabama, Tuscaloosa, AL, 01/20/2023.
3. Talk, Thirty third Annual University of Alabama System Applied Mathematics Meeting, The University of Alabama at Birmingham, Birmingham, AL, 11/06/2021.
2. Poster Presentation, ORNL Summer Poster Sessions, Oak Ridge National Laboratory, Oak Ridge, TN, 08/08/2017.
1. Seminar Talk, Brown Applied Math Graduate Student Seminar, Brown University, Providence, RI, 05/01/2017.

Mentoring Experiences

At The University of Alabama

Graduate Students

- Benjamin Atawiah AU 2023 – Present
- Sanaz Hami Hassan Kiyadeh AU 2023 – Present

Co-advised with Prof. Yulong Xing at The Ohio State University

Undergraduate Students

- Mr. Pedro F. Gonzalez-Medina (University of Puerto Rico) SU 2021
  Ms. Yushan Qu (The Ohio State University)
  Ms. Siwei Xu (Emory University)
  Project: Machine learning of flocking phenomenon.

Project presented at 2021 Young Mathematicians Conference.
Graduate Assistants: Mr. Joseph Hunter and Mr. Wei-Hung Su.

- Mr. Qifan Chen (The Chinese University of Hong Kong) SU 2020
  Project: Fourier analysis for discontinuous Galerkin methods.
  Project presented at 2020 Young Mathematicians Conference.

Graduate Student

- Mr. Joseph Hunter (The Ohio State University) 2020 – 2021

Teaching Experiences

The University of Alabama (Instructor)

4. MATH 611, Numerical PDEs, AU 2023
3. MATH 411, Numerical Analysis I, SP 2022, AU 2022
2. MATH 301, Discrete Mathematics, AU 2021, SP 2022, AU 2022, AU 2023
1. MATH 238, Applied Differential Equations I, SP 2023

The Ohio State University (Instructor)

3. MATH 2415, Ordinary and Partial Differential Equations,
   AU 2018, AU 2019, AU 2020, SP 2021
2. MATH 2177, Mathematical Topics for Engineers, SP 2019, SP 2021
1. MATH 2568, Linear Algebra, SP 2020 (2 Sessions)

Brown University (Teaching Assistant)

2. APMA 0160, Introduction to Scientific Computing, SP 2016
1. APMA 1690, Computational Probability and Statistics, AU 2015

Professional Services

Editorial Activities

- Member of the Editorial Board
  Numerical Methods for Partial Differential Equations 12/2022 – Present
- Review Editor
  Frontiers in Applied Mathematics and Statistics 04/2022 – Present

Journal Referee

1. *Acta Applicandae Mathematicae* 2. *Applied Numerical Mathematics* 3. *Calcolo* 4. *Communications on Applied Mathematics and Computation* 5. *Computational and Applied Mathematics* 6. *Computers and Mathematics with Applications* 7. *ESAIM: Mathematical Modelling and Numerical Analysis* 8. *IMA Journal of Numerical Analysis* 9. *International Journal of Numerical Analysis and Modeling* 10. *Journal of Applied and Computational Mathematics* 11. *Journal of Computational Mathematics* 12. *Journal of Computational Physics* 13. *Journal of Scientific*

Computing 14. *Mathematics of Computation* 15. *Modern Physics Letters A* 16. *Multiscale Modeling and Simulation* 17. *Numerical Linear Algebra with Applications* 18. *Numerical Methods for Partial Differential Equations* 19. *Numerische Mathematik* 20. *Science China Mathematics* 21. *SIAM Journal on Numerical Analysis*

Co-organizer of Conference Minisymposia

- With Prof. Juntao Huang, *High-order numerical methods for partial differential equations*, 5th Annual Meeting of the SIAM TX-LA Section, Houston, TX, 11/06/2022.
- With Prof. Xiangxiong Zhang, *Recent developments in high order numerical methods for partial differential equations*, AMS Spring Central Sectional Meeting, online, 03/26/2022.
- With Prof. Yulong Xing, *Recent advances on discontinuous Galerkin finite element methods: analysis and computation*, SIAM CSE conference, Fort Worth, TX, 03/04/2021.

On-Campus Services

Department Service

- Member of the Department Bylaws Committee 12/2023 – Present
- Member of the Long Range Planning Committee 11/2023 – Present
- Coordinator of the Applied Math Seminar 08/2022 – Present
- Member of the HPC Committee 01/2022 – Present
- Member of the Search Committee for NTRC and FTTI positions 04/2023 – 06/2023

Outreach Activities

- Coordinator of MATHCOUNTS 09/2023 – Present

Memberships of Professional Societies

- Society for Industrial and Applied Mathematics (SIAM) 2017 – Present
- American Mathematical Society (AMS) 2015 – Present