

# Zheng SUN

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Department of Mathematics  
The University of Alabama  
PO Box 870350  
Tuscaloosa, AL 35487  
Email: [zsun30@ua.edu](mailto:zsun30@ua.edu)  
Homepage: <https://zsun.people.ua.edu>

## Education

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- **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 Appointments

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- **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

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- 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

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- 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

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### Preprints

4. Z. Sun, Reducing polynomial degree by one for inner-stage operators affects neither stability nor accuracy of the Runge–Kutta discontinuous Galerkin method. <https://arxiv.org/abs/2404.15453>
3. Q. Chen, Z. Sun and Y. Xing, The Runge–Kutta discontinuous Galerkin method with stage-dependent polynomial spaces for hyperbolic conservation laws. <https://arxiv.org/abs/2402.15150>
2. Z. Sun and Y. Xing, On a numerical artifact of solving shallow water equations with a discontinuous bottom: Analysis and a nontransonic fix. <https://arxiv.org/abs/2308.09265>
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>

### Publications in Refereed Journal (Appeared or Accepted)

16. M. Peng, Z. Sun and K. Wu, OEDG: Oscillation-eliminating discontinuous Galerkin method for hyperbolic conservation laws, *Mathematics of Computation*, to appear.
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*, v46 (2024), pp.A1327-A1351.
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*, v6 (2024), pp.658-687.
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 super-viscosity, *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.

## Selected Academic Visits

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- Institute for Computational and Experimental Research in Mathematics (ICERM), Providence, RI, USA. 01/2024 – 05/2024.
- Computer Science and Mathematics Division, Oak Ridge National Laboratory, Oak Ridge, TN, USA. 06/2019 – 08/2019.

## Talks and Presentations

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### Invited Talks at Seminars/Colloquia

19. CCAM Seminar, Center for Computational and Applied Mathematics, Purdue University, Purdue University, West Lafayette, IN, 04/29/2024.
18. CSCDR Seminar, Center for Scientific Computing and Data Science Research, University of Massachusetts Dartmouth, Dartmouth, MA, 04/03/2024.
17. Seminar, Institute for Computational and Experimental Research in Mathematics, Providence, RI, 03/07/2024.
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

7. 2024 North American High Order Methods Conference, Hanover, NH, 06/19/2024.
6. 2024 Spring Finite Element Circus, Providence, RI, 04/20/2024.
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.

### Posters

3. Numerical Analysis of Multiphysics Problems, ICERM, Providence, RI, 02/14/2024.
2. Los Alamos Workshop on Time Integration for Multiphysics (TIM 2023), Los Alamos, NM, 08/09/2023.
1. ORNL Summer Poster Sessions, Oak Ridge National Laboratory, Oak Ridge, TN, 08/08/2017.

### Other Presentations

3. Applied Math Seminar, Department of Mathematics, The University of Alabama, Tuscaloosa, AL, 01/20/2023.
2. Talk, Thirty third Annual University of Alabama System Applied Mathematics Meeting, The University of Alabama at Birmingham, Birmingham, AL, 11/06/2021.

1. Seminar Talk, Brown Applied Math Graduate Student Seminar, Brown University, Providence, RI, 05/01/2017.

## Student Mentoring

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### The University of Alabama

#### *Graduate Students*

- Benjamin Atawiah AU 2023 – Present
- Sanaz Hami Hassan Kiyadeh AU 2023 – SP 2024

### The Ohio State University (Co-advised with Prof. Yulong Xing)

#### *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

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### The University of Alabama (Instructor)

- MATH 611, Numerical PDEs, AU 2023
- MATH 538, Topics in Mathematics (Finite Element Methods), AU 2024.
- MATH 411, Numerical Analysis I, SP 2022, AU 2022
- MATH 301, Discrete Mathematics, AU 2021, SP 2022, AU 2022, AU 2023, AU 2024
- MATH 238, Applied Differential Equations I, SP 2023

### The Ohio State University (Instructor)

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

### Brown University (Teaching Assistant)

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

## Professional Services

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### 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. *Communications on Pure and Applied Mathematics* 6. *Computational and Applied Mathematics* 7. *Computers and Mathematics with Applications* 8. *Computer Methods in Applied Mechanics and Engineering* 9. *Discontinuity, Nonlinearity, and Complexity* 10. *ESAIM: Mathematical Modelling and Numerical Analysis* 11. *Frontiers in Applied Mathematics and Statistics* 12. *IMA Journal of Numerical Analysis* 13. *International Journal of Numerical Analysis and Modeling* 14. *Journal of Applied and Computational Mathematics* 15. *Journal of Computational Mathematics* 16. *Journal of Computational Physics* 17. *Journal of Scientific Computing* 18. *Mathematics of Computation* 19. *Modern Physics Letters A* 20. *Multiscale Modeling and Simulation* 21. *Numerical Linear Algebra with Applications* 22. *Numerical Methods for Partial Differential Equations* 23. *Numerische Mathematik* 24. *Science China Mathematics* 25. *SIAM Journal on Numerical Analysis*

### Co-organizer of Conference Minisymposia

- With Dr. Ziyao Xu, *Recent advances in finite element methods for flow problems*, 3rd North American High Order Methods Conference, Hanover, NH, 06/19/2024.
- 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

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### Departmental Services

- Member of the Graduate Program Committee 04/2024 – Present
- 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

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- Coordinator of MATHCOUNTS 09/2023 – Present

## Memberships of Professional Societies

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