Curriculum Vitae

Yingda Cheng

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Education

- Ph.D. in Applied Mathematics. Brown University. May 2007.
  Advisor: Chi-Wang Shu.
- M.Sc. in Applied Mathematics. Brown University. May 2004.
- B.Sc. Special Class for the Gifted Young, University of Science and Technology of China. July 2003.

Professional Appointments

- Professor. Department of Mathematics and Computational Modeling & Data Analytics (CMDA) Program (August 2023 -), Virginia Tech.
- Professor. Department of Mathematics, Department of Computational Mathematics, Science and Engineering (July 2021 - , on leave since August 2023), Michigan State University.
- Associate Professor. Department of Mathematics (July 2016 -June 2021), Department of Computational Mathematics, Science and Engineering (August 2017 - June 2021), Michigan State University.
- Assistant Professor. Department of Mathematics (August 2011 - June 2016), Michigan State University.
- Postdoctoral Fellow and Instructor. ICES and Department of Mathematics, the University of Texas at Austin. August 2007 - July 2011.
  Research Mentor: Irene M. Gamba.

Awards and Honors

- SIAM Germund Dahlquist Prize, 2023.
- Knut and Alice Wallenberg Foundation Visiting Professor (Program for Mathematics), 2023.
- Simons Fellow, 2018.
- NSF CAREER Award, 2015.
- ICES Postdoctoral Fellowship, the University of Texas at Austin. 2007-2009.
- Joukowsky Dissertation Fellowship, Brown University. 2006.
- Joukowsky Presidential Fellowship, Brown University. 2003.

Visiting Positions

- Long-term Visitor, ICERM program on "Numerical PDEs: Analysis, Algorithms, and Data Challenges", Spring 2024.

- Senior Fellow, IPAM Long Program on "High dimensional Hamilton-Jacobi PDEs", Spring 2020 (virtual).
- Long-term Visitor, ICERM program on "Model and dimension reduction in uncertain and dynamic systems", Spring 2020.
- Research Professor, MSRI program on "Hamiltonian systems, from topology to applications through analysis", Fall 2018.

Research Interests

General interests: numerical analysis, scientific computing, data-driven modeling and computation.

- Discontinuous Galerkin finite element methods.
- Kinetic simulations with applications in semiconductor device and plasma simulations.
- Sparse grid methods for high-dimensional PDEs.
- Machine learning methods for kinetic simulations.
- Reduced order modeling, in particular reduced basis methods.
- High order numerical methods for Hamilton-Jacobi equation and its applications.
- Numerical methods for Maxwell models in nonlinear optics.

Research Grants

- Current.
  - PI, subaward from DOE-Mathematical Multifaceted Integrated Capability Centers grant, *Center for Hierarchical and Robust Modeling of Non-Equilibrium Transport (CHaRMNET)*, 2022-2027. (PI: Andrew Christlieb).
  - PI, NSF DMS-2011838, *Development of adaptive sparse grid discontinuous Galerkin methods for multiscale kinetic simulations in plasmas*, $200,000, 2020-2024.
- Past & Completed.
  - Co-PI, NSF AST-2008004, *A data-driven approach to multiscale methods for scalable transport in neutron star mergers and complex plasmas*, $433,399, 2020-2023. (PI: Andrew Christlieb, Co-PI: Luke Roberts).
  - Co-PI, NSF DGE-2152014, *Harnessing the Data Revolution to Enable Predictive Multi-scale Modeling across STEM*, $2,965,563, 2022-2023.
  - PI, NSF DMS-1453661, *CAREER: Development of discontinuous Galerkin methods for kinetic equations in high dimensions*, $400,000, 2015-2021.
  - Simons Fellowship, $91,904, 2018.
  - PI, NSF DMS-1720023, *OP: Collaborative research: compatible discretizations for Maxwell models in nonlinear optics*, $100,000, 2017-2020.
  - PI, NSF DMS-1318186, *Developing energy-conserving deterministic solvers for kinetic electromagnetic plasma simulations*, $142,650, 2013-2016.
  - Co-PI, AFOSR FA9550-12-1-0343, *Novel tools for the modeling and simulation of ultra cold plasmas*, $269,293, 2012-2017. (PI: Andrew Christlieb, Co-PI: John Verboncoeur)
  - PI, NSF DMS-1016001, *Development of discontinuous Galerkin methods for kinetic transport models and control problems with state constraints*, $101,591, 2010-2014. (Transferred to Michigan State University as NSF DMS-1217563)

Mentoring

- Ph.D. students.
  - Current students.
    - Tyson George
  - Former students.
    - Andrés Galindo Olarte (Ph.D. MSU 2023).
      Thesis title: Superconvergence and Accuracy Enhancement of Discontinuous Galerkin solutions for Vlasov-Maxwell equations and Numerical Analysis of a Hybrid Method for Radiation Transport.
      First job after Ph.D.: Peter O'Donnell Jr. Postdoc Fellow at University of Texas at Austin.
    - Kai Huang (Ph.D. MSU 2022).
      Thesis title: Sparse Grid Discontinuous Galerkin Methods for Nonlinear Optics and Mathematical Modeling of Asynchronous Data Flow in Parallel Computers.
      First job after Ph.D.: Synopsys, North Carolina.
    - Anqi Chen (Ph.D. MSU 2019).
      Thesis title: On superconvergent discontinuous Galerkin methods for Schrödinger equations and sparse grid central discontinuous Galerkin method.
      First job after Ph.D.: Cadence Design Systems, Austin, TX.
    - Zixuan Wang (Ph.D. MSU 2015).
      Thesis title: Discontinuous Galerkin methods for Hamilton-Jacobi equations and high-dimensional elliptic equations.
      First job after Ph.D.: Senior quantitative analyst, Ernst & Young LLP, New York City.
- Postdocs.
  - Current postdoc.
  - Former postdocs.
    - Zhichao Peng (2020-2023). Currently: Assistant professor, Hong Kong University of Science and Technology.
    - Juntao Huang (2018-2022). Currently: Assistant professor, Texas Tech University.
    - Zhanjing Tao (2016-2019). Currently: Associate professor, Jilin University, China.
    - Puttha Sakkaplangkul (2017-2018). Currently: King Mongkuts Institute of Technology Ladkrabang, Thailand.
    - Xinghui Zhong (2012-2014). Currently: Special-term professor, Zhejiang University, China.
- M.Sc. students.
  - Jing Huang (Visiting Master student, Chongqing University, China), Fall 2016.
  - Jingyun Fan, Conrad Blom, Tong Mu, Spring 2015.
    Industrial math project: Using risk analysis in the control of medicine quality in limited-resource countries.
  - Conrad Blom, Tong Mu, Xiaodan Liu, Spring 2016.
    Industrial math project: Improving medicines quality prediction in limited-resource countries.
- Undergraduate students.
  - Fall 2014: Mingxiu Sui.
    Project title: Nonlinear equation solvers.
  - Spring 2015: Ying Lu (exchange student from Xian Jiaotong University).
    Project title: Discontinuous Galerkin methods for hyperbolic equations.
  - Spring 2016: Zhaoyang Fu (exchange student from Xian Jiaotong University), Brad Yurgens.
    Project title: Numerical approximation methods on sparse grids.

Publications and Preprints

Publications in Refereed Journals

1. Y. Cheng and C.-W. Shu, A discontinuous Galerkin finite element method for directly solving the Hamilton-Jacobi equations, *Journal of Computational Physics*, v223 (2007), pp.398-415.

2. Y. Cheng and C.-W. Shu, A discontinuous Galerkin finite element method for time dependent partial differential equations with higher order derivatives, *Mathematics of Computation*, v77 (2008), pp.699-730.

3. Y. Cheng, I. M. Gamba, A. Majorana and C.-W. Shu, Discontinuous Galerkin solver for Boltzmann-Poisson transients, *Journal of Computational Electronics*, v7 (2008), pp.119-123.

4. Y. Cheng and C.-W. Shu, Superconvergence and time evolution of discontinuous Galerkin finite element solutions, *Journal of Computational Physics*, v227 (2008), pp.9612-9627.

5. Y. Cheng and C.-W. Shu, Superconvergence of local discontinuous Galerkin methods for one-dimensional convection-diffusion equations, *Computers and Structures*, v87 (2009), pp.630-641.

6. Y. Cheng, I. M. Gamba, A. Majorana and C.-W. Shu, A discontinuous Galerkin solver for Boltzmann Poisson systems in nano devices, *Computer Methods in Applied Mechanics and Engineering*, v198 (2009), pp.3130-3150.

7. Y. Cheng and C.-W. Shu, Superconvergence of discontinuous Galerkin and local discontinuous Galerkin schemes for linear hyperbolic and convection diffusion equations in one space dimension, *SIAM Journal on Numerical Analysis*, v47 (2010), pp. 4044-4072.

8. O. Bokanowski, Y. Cheng and C.-W. Shu, A discontinuous Galerkin solver for front propagation, *SIAM Journal on Scientific Computing*, v33 (2011), pp.923-938.

9. Y. Cheng, I. M. Gamba, A. Majorana and C.-W. Shu, A brief survey of the discontinuous Galerkin method for the Boltzmann-Poisson equations, *SEMA Journal*, v54 (2011), pp.47-64.

10. Y. Cheng, I. M. Gamba and K. Ren, Recovering doping profiles in semiconductor devices with the Boltzmann-Poisson model, *Journal of Computational Physics*, v230 (2011), pp. 3391-3412.

11. Y. Cheng and I. M. Gamba, Numerical study of one-dimensional Vlasov-Poisson equations in the simulation for infinite homogeneous stellar systems, *Communications in Nonlinear Science and Numerical Simulation (Special Issue dedicated to P. J. Morrison's 60th Birthday)*, v17 (2011), pp. 2052-2061.

12. Y. Cheng, I. M. Gamba and J. Proft, Positivity-preserving discontinuous Galerkin schemes for linear Vlasov-Boltzmann transport equations, *Mathematics of Computation*, v81 (2012), pp. 153-190.

13. Y. Cheng, I. M. Gamba and P. J. Morrison, Study of conservation and recurrence of Runge-Kutta discontinuous Galerkin schemes for Vlasov-Poisson systems, *Journal of Scientific Computing*, v56 (2013), pp. 319-349.

14. O. Bokanowski, Y. Cheng and C.-W. Shu, A discontinuous Galerkin scheme for front propagation with obstacles, *Numerische Mathematik*, v126 (2014), pp. 1-31.

15. Y. Cheng, A. J. Christlieb and X. Zhong, Energy-conserving discontinuous Galerkin methods for Vlasov-Ampère systems, *Journal of Computational Physics*, v256 (2014), pp. 630-655.

16. R. Alonso, J. Young and Y. Cheng, A particle interaction model for the simulation of biological, cross-linked fiber networks inspired from flocking theory, *Cellular and Molecular Bioengineering*, v7 (2014), pp. 58-72.

17. Y. Cheng, I. M. Gamba, F. Li and P. J. Morrison, Discontinuous Galerkin schemes for Vlasov-Maxwell equations, *SIAM Journal on Numerical Analysis*, v52 (2014), pp.1017-1049.

18. Y. Cheng and Z. Wang, A new discontinuous Galerkin Method for directly solving the Hamilton-Jacobi equations, *Journal of Computational Physics*, v268 (2014), pp. 134-153.

19. Y. Cheng, A. J. Christlieb and X. Zhong, Energy-conserving discontinuous Galerkin methods for Vlasov-Maxwell systems, *Journal of Computational Physics*, v279 (2014), pp. 145-173.

20. Y. Cheng, A. J. Christlieb and X. Zhong, Energy-conserving numerical simulations of electron holes in two-species plasmas, *European Physical Journal D*, v69 (2015), 67.

21. Y. Cheng, A. J. Christlieb and X. Zhong, Numerical study of the two-species Vlasov-Ampère system: energy-conserving schemes and the current-driven ion-acoustic instability, *Journal of Computational Physics*, v288 (2015), pp. 66-85.

22. O. Bokanowski, Y. Cheng and C.-W. Shu, Convergence of discontinuous Galerkin schemes for front propagation with obstacles, *Mathematics of Computation*, v85 (2016), pp.2131-2159.

23. Y. Cheng, C.-S. Chou, F. Li and Y. Xing, L^2-stable discontinuous Galerkin methods for one-dimensional two-way wave equations, *Mathematics of Computation*, v86 (2017), pp.121-155.

24. Z. Wang, Q. Tang, W. Guo and Y. Cheng, Sparse grid discontinuous Galerkin methods for high-dimensional elliptic equations, *Journal of Computational Physics*, v314 (2016), pp. 244-263.

25. W. Guo and Y. Cheng, A sparse grid discontinuous Galerkin method for high-dimensional transport equations and its application to kinetic simulations, *SIAM Journal on Scientific Computing*, v38 (2016), pp. A3381-A3409.

26. Y. Cheng, A. J. Christlieb, W. Guo and B. Ong, An asymptotic preserving Maxwell solver resulting in the Darwin limit of electrodynamics, *Journal of Scientific Computing*, v71 (2017), pp. 959-993.

27. Y. Liu, Y. Cheng and C.-W. Shu, A simple bound-preserving sweeping technique for conservative numerical approximations, *Journal of Scientific Computing*, v73 (2017), pp. 1028-1071.

28. J. Morales-Escalante, I. M. Gamba, Y. Cheng, A. Majorana, C.-W. Shu and J. Chelikowsky, Discontinuous Galerkin deterministic solvers for a Boltzmann-Poisson model of hot electron transport by averaged empirical pseudopotential band structures, *Computer Methods in Applied Mechanics and Engineering*, v321 (2017), pp. 209-234.

29. W. Guo and Y. Cheng, An adaptive multiresolution discontinuous Galerkin method for time-dependent transport equations in multi-dimensions, *SIAM Journal on Scientific Computing*, v39 (2017), pp. A2962-A2992.

30. V. A. Bokil, Y. Cheng, Y. Jiang and F. Li, Energy stable discontinuous Galerkin methods for Maxwell's equations in nonlinear optical media, *Journal of Computational Physics*, v350 (2017), pp. 420-452.

31. R. J. Alonso, V. Bagland, Y. Cheng and B. Lods, One-dimensional dissipative Boltzmann equation: measure solutions, cooling rate, and self-similar profile, *SIAM Journal on Mathematical Analysis*, v50 (2018), pp. 1278-1321.

32. V. A. Bokil, Y. Cheng, Y. Jiang, F. Li and P. Sakkaplangkul, High spatial order energy stable FDTD methods for Maxwell's equations in nonlinear optical media, *Journal of Scientific Computing*, v77 (2018), pp. 330-371.

33. A. Chen, F. Li and Y. Cheng, An ultra-weak discontinuous Galerkin method for Schrödinger equation in one dimension, *Journal of Scientific Computing*, v78 (2019), pp. 772-815.

34. P. Fu, Y. Cheng, F. Li and Y. Xu, Discontinuous Galerkin methods with optimal L^2 accuracy for PDEs with high order spatial derivatives, *Journal of Scientific Computing*, v78 (2019), pp. 816-863.

35. Z. Tao, W. Guo and Y. Cheng, Sparse grid discontinuous Galerkin methods for Vlasov-Maxwell systems, *Journal of Computational Physics:X*, v3 (2019), 100022.

36. Y. Liu, Y. Cheng, S. Chen and Y.-T. Zhang, Krylov implicit integration factor discontinuous Galerkin methods on sparse grids for high dimensional reaction-diffusion equations, *Journal of Computational Physics*, v388 (2019), pp. 90-102.

37. Z. Tao, A. Chen, M. Zhang and Y. Cheng, Sparse grid central discontinuous Galerkin method for linear hyperbolic systems in high dimensions, *SIAM Journal on Scientific Computing*, v41 (2019), pp. A1626-1651.

38. Y. Jiang, P. Sakkaplangkul, V. A. Bokil, Y. Cheng and F. Li, Dispersion analysis of finite difference and discontinuous Galerkin schemes for Maxwell's equations in linear Lorentz media, *Journal of Computational Physics*, v394 (2019), pp. 100-135.

39. Z. Peng, V. Bokil, Y. Cheng and F. Li, Asymptotic and positivity preserving methods for Kerr-Debye model with Lorentz dispersion in one dimension, *Journal of Computational Physics*, v402 (2020), pp. 109101.

40. M. Jiao, Y. Cheng, Y. Liu and M. Zhang, Central discontinuous Galerkin methods for the generalized Korteweg-de Vries equations, *Communications in Computational Physics*, v28 (2020), No. 3, pp. 927-966.

41. D. Appelö, V. Bokil, Y. Cheng and F. Li, Energy stable SBP-FDTD methods for Maxwell-Duffing models in nonlinear photonics, *IEEE Journal on Multiscale and Multiphysics Computational Techniques*, v4 (2019), pp. 329-336.

42. A. Chen, Y. Cheng, Y. Liu and M. Zhang, Superconvergence of ultra-weak discontinuous Galerkin methods for the linear Schrödinger equation in one dimension, *Journal of Scientific Computing*, v82 (2020), pp. 1-44.

43. Z. Peng, Y. Cheng, J.-M. Qiu and F. Li, Stability-enhanced AP IMEX-LDG schemes for linear kinetic transport equations under a diffusive scaling, *Journal of Computational Physics*, v415 (2020), pp. 109485.

44. J. Huang and Y. Cheng, An adaptive multiresolution discontinuous Galerkin method with artificial viscosity for scalar hyperbolic conservation laws in multidimensions, *SIAM Journal on Scientific Computing*, v42 (2020), A2943-2973.

45. Z. Tao, Y. Jiang and Y. Cheng, An adaptive high-order piecewise polynomial based sparse grid collocation method with applications, *Journal of Computational Physics*, v43 (2021), pp. 109770.

46. J. Huang, Y. Liu, W. Guo, Z. Tao and Y. Cheng, An adaptive multiresolution interior penalty discontinuous Galerkin method for wave equations in second order form, *Journal of Scientific Computing*, to appear.

47. Z. Tao, J. Huang, Y. Liu, W. Guo and Y. Cheng, An adaptive multiresolution ultra-weak discontinuous Galerkin method for nonlinear Schrödinger equations, *Communications on Applied Mathematics and Computation (Special issue on discontinuous Galerkin methods)*, to appear.

48. Z. Peng, Y. Cheng, J.-M. Qiu and F. Li, Stability-enhanced AP IMEX1-LDG method: energy-based stability and rigorous AP property, *SIAM Journal on Numerical Analysis*, to appear.

49. W. Guo, J. Huang, Z. Tao and Y. Cheng, An adaptive sparse grid local discontinuous Galerkin method for Hamilton-Jacobi equations in high dimensions, *Journal of Computational Physics*, v436 (2021), pp. 110294.

50. M. Lyu, V. Bokil, Y. Cheng and F. Li, Energy stable nodal discontinuous Galerkin methods for nonlinear Maxwell's equations in multi-dimensions, *Journal of Scientific Computing*, to appear.

51. J. Huang, Y. Liu, Y. Liu, Z. Tao and Y. Cheng, A class of adaptive multiresolution ultra-weak discontinuous Galerkin methods for some nonlinear dispersive wave equations, *SIAM Journal on Scientific Computing*, to appear.

52. J. Huang, Y. Cheng, A. J. Christlieb and L. Roberts, Machine learning moment closure models for the radiative transfer equation I: directly learning a gradient based closure, *Journal of Computational Physics*, to appear.

53. Z. Peng, Y. Chen, Y. Cheng and F. Li, A reduced basis method for radiative transfer equation, *Journal of Scientific Computing (Special issue on model order reduction)*, to appear.

54. M. Lyu, V. Bokil, Y. Cheng and F. Li, Energy stable nodal DG methods for Maxwell's equations of mixed-order form in nonlinear optical media, *Communications on Applied Mathematics and Computation*, to appear.

55. J. Huang, Y. Cheng, A. J. Christlieb and L. F. Roberts, Machine learning moment closure models for the radiative transfer equation III: enforcing hyperbolicity and physical characteristic speeds, *Journal of Scientific Computing*, to appear.

56. J. Huang, Y. Cheng, A. J. Christlieb, L. F. Roberts and W.-A. Yong, Machine learning moment closure models for the radiative transfer equation II: enforcing global hyperbolicity in gradient based closures, *SIAM Journal on Multiscale Modeling and Simulation*, to appear.

57. J. Huang, W. Guo and Y. Cheng, Adaptive sparse grid discontinuous Galerkin method: review and software implementation, *Communications on Applied Mathematics and Computation (Special issue in memory of Prof. Ching-Shan Chou)*, to appear.

Publications in Conference Proceedings

58. Y. Cheng, I. M. Gamba, A. Majorana and C.-W. Shu, Discontinuous Galerkin solver for the semiconductor Boltzmann equation, *SISPAD 07*, T. Grasser and S. Selberherr, editors, Springer (2007) pp. 257-260.

59. Y. Cheng, I. M. Gamba, A. Majorana and C.-W. Shu, A discontinuous Galerkin solver for full-band Boltzmann-Poisson models, *Proceeding of IWCE13* (2009), pp. 211-214.

60. Y. Cheng, I. M. Gamba, A. Majorana and C.-W. Shu, Performance of Discontinuous Galerkin Solvers for Semiconductor Boltzmann Equations, *Proceeding of IWCE14* (2010), pp. 211-214.

61. Y. Cheng, I. M. Gamba, A. Majorana and C.-W. Shu, Discontinuous Galerkin methods for the Boltzmann-Poisson systems in semiconductor device simulations , *AIP Conference Proceedings*, v1333 (2011), pp. 890-895.

62. Y. Chen, Z. Chen, Y. Cheng, A. Gillman and F. Li, Study of discrete scattering operators for some linear kinetic models, *The IMA Volumes in Mathematics and its Applications*, v160 (2016), Susanne Brenner (Ed): Topics in Numerical Partial Differential Equations and Scientific Computing, pp.99-136, Springer.

63. D. Appelö, V. Bokil, Y. Cheng and F. Li, Energy stable staggered high order finite differences for optical media, *2019 International Applied Computational Electromagnetics Society Symposium (ACES)*, pp. 1-2.

Preprints

64. A. Galindo-Olarte, J. Huang, J. Ryan and Y. Cheng, Superconvergence and accuracy enhancement of discontinuous Galerkin solutions for Vlasov-Maxwell equations, submitted to *BIT Numerical Mathematics*, 2022.

65. Z. Peng, Y. Chen, Y. Cheng and F. Li, A micro-macro decomposed reduced basis method for the time-dependent radiative transfer equation, submitted to *SIAM Journal on Multiscale Modeling and Simulation*, 2022.

Teaching Experience

- Courses taught at Michigan State University.
  - Graduate level classes: *MTH 851/852 Numerical methods for ODEs (Graduate qualifying sequence)*, Spring 2012-2017. *MTH 950 Numerical methods for partial differential equations I*, Spring 2017, Spring 2021. *MTH 852 Numerical analysis III, spectral methods,* Fall 2013. *MTH 995 Numerical methods for hyperbolic conservation laws (Graduate topic class),* Fall 2012.
  - Undergraduate level classes: *MTH 132 Calculus I,* Fall 2017. *MTH 133 Calculus II,* Fall 2011, 2014, 2015. *MTH 340 Ordinary differential equations,* Fall 2019.
  - Undergraduate level classes in flipped class format with active learning approach for data science: *CMSE 201. Introduction to computational modeling and data analysis,* Fall 2019, Spring 2022, Spring 2023. *CMSE 202. Computational modeling tools and techniques,* Fall 2020. (Flipped class with active learning approach for data science) *CMSE/MTH 314 Matrix algebra with computational applications,* Fall 2022.
- Teaching experience at the Department of Mathematics, the University of Texas at Austin.

  M316 Elementary statistical methods, Fall 2010. M408L Integral calculus, Fall 2009, Fall 2008. M348 Scientific computation in numerical analysis, Spring 2008. M408L Integral calculus, Fall 2007.
- Teaching Assistant for a short course in discontinuous Galerkin methods. Beijing, China. August, 2009.
- Sheridan Center Teaching Certificate I, 2006. Brown University.
- Teaching Assistant. Division of Applied Mathematics, Brown University.

  AM 34 Methods of Applied Mathematics, II, Fall 2004, Spring 2005.

Conferences/Workshops/Seminars

- Funded research collaboration/visit.

- J.T.O. faculty fellowship, ICES, the University of Texas at Austin, 2016.
- Research in Pairs, MFO, Oberwolfach, 2016 (with V. A. Bokil, F. Li).
- ICERM-collaborate, 2016 (with V. A. Bokil, F. Li).

- Travel awards.
  - NSF Postdoc/Early Career Travel Award, 2009.
  - IPAM long program: Quantum and Kinetic Transport: Analysis, Computations, and New Applications, March 9 - June 12, 2009, IPAM, UCLA.
  - AWM-NSF Travel Grant, 2008, 2010.
  - Mathematics Research Communities (MRC), June 21-27, 2008, Snow Bird, Utah.

- Workshop/minisymposium organization.
  - Organized a minisymposium titled "Taming the curse of dimensionality in non-equilibrium transport systems: reduced order models and machine learning" in 2022 SIAM Great Lakes Section Annual Meeting, Wayne State University.
  - Co-organized a minisymposium titled "Fast numerical methods for high dimensional problems" in SciCADE 2022 (invited).
  - Co-organized a minisymposium titled "Recent development in analysis and computation of hyperbolic and kinetic problems" in SIAM PD19.
  - Co-organized a minisymposium titled "Novel Computational Methods for Electromagnetic Problems in Complex and Fabricated Materials" in ICIAM 2019, Valencia, Spain.
  - Co-organized an ICERM Topical workshop titled "Computational aspects of time dependent electromagnetic wave problems in complex materials" at ICERM, Brown University, 2018.
  - Co-organized a workshop titled "Kinetic Equations: modeling, analysis and numerics " at the University of Texas at Austin, 2017.
  - Co-organized a minisymposium titled "Recent advance on high order numerical methods for partial differential equations" at 2nd annual meeting of SIAM Central States Section, 2016, University of Arkansas at Little Rock, Arkansas.
  - Co-organized a minisymposium titled "New advances in discontinuous Galerkin methods" at ICOSAHOM, 2016, Rio de Janeiro, Brazil.
  - Co-organized a minisymposium titled "Efficient high-order numerical methods for nonlinear PDEs" at the SIAM Conference on Computational Science and Engineering, 2015, Salt Lake City.
  - Co-mentored a research team "Fast solvers for kinetic equations", in IMA Special Workshop WhAM! A Research Collaboration Workshop for Women in Applied Mathematics: Numerical Partial Differential Equations and Scientific Computing, 2014.
  - Co-organized a minisymposium titled "High order numerical methods for hyperbolic and kinetic equations" at the SIAM Conference on Analysis of Partial Differential Equations, 2013, Orlando, FL.
  - Co-organized a special session "Numerical Methods for PDEs" at AWM Research Symposium, March 16-17, 2013.
  - Co-organized the workshop "Algorithm and Model Verification and Validation For Kinetic Plasma Simulation Codes", November 2012, Michigan State University.
  - Co-organized a minisymposium titled "Advances in high order numerical methods for PDEs in computational mathematics" in ICIAM 2011, Vancouver, Canada.
  - Co-organized a minisymposium titled "Advanced numerical methods for kinetic Equations" in SIAM Annual Meeting, 2009, Denver, CO.

- Recent invited talks (since September 2011).
  - AMS Spring Central Sectional Meeting, University of Cincinnati, April 2023.
  - SIAM Great Lakes Section Annual Meeting, Wayne State University, September 2022.

– SciCADE 2022, University of Iceland, July 2022.
– Seminar, Umeå University, Sweden, June 2022.
– Invited plenary talk, Midwest Numerical Analysis Day, University of Michigan, Ann Arbor, May 2022.
– Seminar at Isaac Newton Institute for Mathematical Sciences, May 2022 (virtual).
– MSU AWM/AMS seminar, 2021 (virtual).
– Numerical analysis seminar, University of Iowa, 2021 (virtual).
– Workshop on "recent development in numerical kinetic theory", 2021 (virtual).
– SIAM CSE, 2021 (virtual).
– ICERM workshop on "Mathematical and Computational Approaches for Solving the Source-Free Einstein Field Equations", October 2020 (virtual).
– Seminar, October 2019, Auburn University.
– Second Conference on Scientific and Engineering Computing for Young Chinese Scientists, August 2019, Beijing, China.
– ICIAM 2019, July 2019, Valencia, Spain.
– Seminar, June 2019, Uppsala University, Sweden.
– Seminar, June 2019, Universität Düsseldorf, Germany.
– Seminar, May 2019, Chalmers University of Technology, Sweden.
– IMA workshop on "Mathematics in Optical Imaging", April 2019, IMA, University of Minnesota.
– 2019 AWM Research Symposium, April 2019, Rice University.
– Applied math seminar, March 2019, Colorado State University.
– SIAM CSE conference, February 2019, Spokane, Washington.
– Applied math colloquium, September 2018, University of Colorado, Boulder.
– ICERM workshop "Computational aspects of time dependent electromagnetic wave problems in complex materials", June 2018, Brown University.
– Applied math seminar, April 2018, Brown University.
– 2018 Spring Central Sectional AMS Meeting, March 2018, Ohio State University.
– The first annual meeting of International Consortium of Chinese Mathematicians (ICCM), December 2017, Sun Yat Sen University, Guangzhou, China.
– Young mathematician forum, December 2017, Peking University.
– Applied math seminar, October 2017, Central Michigan University.
– The third international workshop on development and application of high-order numerical methods, December 2016, University of Science and Technology of China, Hefei, China.
– Center of numerical analysis seminar, October 2016, the University of Texas at Austin.
– CCAM seminar, October 2016, Purdue University.
– Geometric algorithms and methods for plasma physics, September 2016, Garching, Germany.
– Seminar, University of Science and Technology of China, July 2016, Hefei, China.
– ICOSAHOM, June 2016, Rio de Janeiro, Brazil.
– Workshop on "Boundary value problems and multi-scale coupling methods for kinetic equations", April 2016, University of Wisconsin-Madison.
– Center of numerical analysis seminar, April 2016, the University of Texas at Austin.
– ACMS colloquium, March 2016, University of Notre Dame.
– Miniworkshop on modeling, analysis, computation and application of kinetic problems, February 2016, Brown University.
– Seminar, University of Science and Technology of China, December 2015, Hefei, China.

- Seminar, University of East Anglia, September 2015, Norwich, U.K.
- Conference on "The Cauchy Problem in Kinetic Theory: Recent Progress in Colliosionless Models", September 2015, Imperial College London, U.K.
- International workshop on numerical simulation for multimaterial and multiphysics flows, August 2015, Beijing, China.
- ICIAM 2015, August 2015, Beijing, China.
- International Workshop on Moving Mesh and High Order Numerical Methods, August 2015, Xiamen, China.
- Seminar, University of Science and Technology of China, August 2015, Hefei, China.
- BIRS workshop: Higher Order Numerical Methods for Evolutionary PDEs: Applied Mathematics Meets Astrophysical Applications, May 2015, Banff, Canada.
- SIAM CSE conference, March 2015, Salt Lake City.
- Applied Math Seminar, Brown University, February 2015.
- Seminar, University of Science and Technology of China, December 2014, Hefei, China.
- Seminar, Xiamen University, December 2014, Xiamen, China.
- ICOSAHOM, June 2014, Salt Lake City, Utah.
- Math Colloquium, RPI, May 2014.
- AMS Southeastern Spring Sectional Meeting, March 2014, University of Tennessee.
- Applied Math Seminar, Brown University, February 2014.
- Applied Math Seminar, Wayne State University, October 2013.
- IEEE Pulsed Power & Plasma Science, June 2013, San Francisco.
- ICERM workshop on "Issues in Solving the Boltzmann Equation for Aerospace Applications. June 2013, ICERM, Brown University.
- 71st Midwest PDE seminar, May 2013, University of Michigan-Ann Arbor.
- AMS spring central sectional meeting, April 2013, Iowa State University.
- SIAM CSE conference, February 2013, Boston, MA.
- 2012 Young Researchers Workshop: Kinetic Description of Multiscale Phenomena, October, 2012, University of Wisconsin-Madison.
- Three-hour tutorial lecture, ICERM Program on Kinetic Theory and Computation, Novel Applications of Kinetic Theory and Computations, October 2011, ICERM, Brown University.
- ICERM Program on Kinetic Theory and Computation, Vlasov Models in Kinetic Theory, September 2011, ICERM, Brown University.

- Recent contributed talks, posters and conference participation (since September 2011).
  - AIM workshop "Deep learning and partial differential equations", October 2019.
  - International Workshop on "Wavelets & CFD", June 2019, École Normale SupÃ©rieure (ENS).
  - Midwest Numerical Analysis Day, April 2019, Illinois Institute of Technology.
  - Simons Foundation Mathematics and Physical Sciences Annual Meeting, October 2018, New York.
  - Recent Advances and Challenges in Discontinuous Galerkin Methods and Related Approaches, June 2017, IMA.
  - Frontiers in applied and computational mathematics in honor of 60th birthday of Professor Chi-Wang Shu, January 2017, Brown University.
  - Frontiers in computing and data science, September 2015, Michigan State University.
  - Recent developments in discontinuous Galerkin finite element methods for partial differential equations, John H. Barrett Lectures, May 2012, the University of Tennessee, Knoxville.

- Advances in Scientific Computing, Imaging Science and Optimization: Stan Osher's 70th Birthday Conference, April 2012, IPAM, UCLA.
- Second Monterey Workshop on Computational Issues in Nonlinear Control, November, 2011, Monterey, CA.

Professional Service

- Service to the math department, Virginia Tech.
- Service to Michigan State University.
  - Chair (2019), co-chair (2018), Engineering, Physical Sciences and Mathematics review panel for the Strategic Partnership Grant (SPG) Program.
- Service to the math department, Michigan State University.
  - Advisory committee, 2022.
  - Chair search committee, 2021.
  - Sub-committee on the core research priorities, 2019.
  - Hiring committee, 2017, 2018.
  - Graduate studies committee, 2016, 2020, 2021.
  - Colloquium committee, 2014.
  - Organizer, applied math seminar, 2011.
  - Fund manager, applied math seminar, 2017.
  - Contributions to the graduate program.
    - Mentor of incoming graduate student: Ling Le.
    - Panelist on "looking for jobs" for graduate students and postdocs, October 2018.
    - Presenter of "Survey of applied math and computation at MSU" at graduate student visit day, March 2016.
    - Panelist on "Responsible Professional Conduct" for first year graduate students, January 2016.
    - Faculty liaison for graduate student recruitment, spring 2016, 2020.
    - Ph. D. dissertation committee member.
      Liping Yin, Craig Gross, Sheng Chen, Firat Cakir, Sami Merhi, Dave Bramer, Chao Song, Bosu Choi, Yin Cao, Qinfeng Gao, Xiao Feng, Hana Cho, Qi Tang, Eric Wolf, Xianfeng Hu, Jaylan Jones, Jun Lai, Yuliang Wang, Lee Van Groningen.
    - Ph. D. comprehensive exam committee member.
      Affan Malik, Liping Yin, Sheng Chen, Craig Gross, William Sands, Matthew Bauerle, Firat Cakir, Jian Song, Sami Merhi, Chao Song, Qinfeng Gao, Bosu Choi, Ruochuan Zhang, Dave Bramer, Hana Cho, Eric Wolf, Yuqi Hong, Liping Chen, Qi Tang.
    - M.Sc. in industrial math portfolio defense committee member.
      Conrad Blom, Tong Mu, Weicong Zhou, Jingyun Fan, Yunyun Wei.
- Service to the CMSE department, Michigan State University.
  - Faculty mentor of Ekaterina Rapinchuk, Elizabeth Munch.
  - Chair search committee, 2022.
  - Search committee for fixed term assistant professors, 2020.
  - RPT committee, 2019, 2020.
  - Advisory committee, 2017, 2018.
  - Hiring committee, 2014, 2016.
  - Award committee, 2021.

- Reviewer for external grant proposals.
  - Panelist for NSF-DMS, 2011, 2014, 2015, 2016, 2018, 2019, 2020, 2022, 2023.
  - Reviewer of proposal submitted to BIRS, 2022.
  - Ad hoc proposal review for NSF, 2021.
  - Reviewer of DOE proposals, 2014, 2015.
  - Reviewer for the Research Grants Council (RGC) of Hong Kong, 2014, 2015, 2018.
  - Reviewer for Netherlands Foundation for Fundamental Research on Matter, 2014.
  - Reviewer for IGSSE, TUM proposal, 2016.
- Referee for journals.
  - ACM Transactions on Mathematical Software
  - Acta Mechanica Sinica
  - Advances in Computational Mathematics
  - Annals of Mathematical Sciences and Applications
  - Applied Mathematics and Computation
  - Applied Mathematics Letters
  - Applied Numerical Mathematics
  - BIT Numerical Mathematics
  - Bulletin of the American Mathematical Society
  - CALCOLO
  - Communication in Computational Physics
  - Communications in Mathematical Sciences
  - Computer Methods in Applied Mechanics and Engineering
  - Discrete and Continuous Dynamical Systems Series B
  - ESAIM: Mathematical Modelling and Numerical Analysis (M2AN)
  - Handbook of Numerical Analysis
  - IEEE Journal on Multiscale and Multiphysics Computational Techniques
  - International Journal of Numerical Analysis and Modeling
  - International Journal for Numerical Methods in Fluids
  - Journal of Computational and Applied Mathematics
  - Journal of Computational Mathematics
  - Journal of Computational Physics
  - Journal of Numerical Mathematics: Theory, Methods, and Applications
  - Journal of Scientific Computing
  - Journal of Statistical Physics
  - Kinetic and Related Models
  - Mathematics of Computation
  - Mathematics and Computers in Simulation
  - Mathematical Reviews (MathSciNet)
  - Numerical Algorithms
  - Numerical Methods for Partial Differential Equations
  - Proceedings of the Royal Society A
  - Science China Mathematics

- SIAM Journal on Numerical Analysis
- SIAM Journal on Scientific Computing

Outreach

- Mentoring and outreach activities for women in math.
  - Speaker at MSU AWM/AMS seminar, 2021.
  - Member of WINASC: Women in Numerical Analysis and Scientific Computing.
  - Speaker at "Women in Applied Mathematics: Recent advances in modeling, numerical algorithms, and applications" at the 9th International Congress on Industrial and Applied Mathematics (ICIAM), July, 2019.
  - Speaker at WINASC Special Session at the 2019 AWM Research Symposium, Rice University.
  - Organizer of WINASc gathering, SIAM CSE, February 2019.
  - Organizer and participant of WINASC luncheon at a workshop at ICERM, July 2018.
  - Participant of "Women in Applied Mathematics: Recent advances in modeling, numerical algorithms, and applications at the 8th International Congress on Industrial and Applied Mathematics (ICIAM), August, 2015.
  - Co-mentored a research team "Fast solvers for kinetic equations", in IMA Special Workshop WhAM! A Research Collaboration Workshop for Women in Applied Mathematics: Numerical Partial Differential Equations and Scientific Computing, 2014.
  - Co-organized a special session "Numerical Methods for PDEs" at AWM Research Symposium, March 16-17, 2013.