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Jesse Chan

Education

2008–2013 **Institute for Computational Engineering and Sciences (ICES)**, *The University of Texas*, Austin, TX.
- PhD in Computational Sciences, Engineering and Mathematics (CSEM).
  - Advisors: Leszek Demkowicz and Robert Moser.
  - Thesis: A Discontinuous Petrov-Galerkin Method for Convection-Diffusion Problems.
- MA in Computational Sciences, Engineering and Mathematics (CSEM).

2004–2008 **B.A. in Computational and Applied Mathematics**, *Rice University*, Houston, TX.

Professional experience

2016–present **Assistant Professor**, *Department of Computational and Applied Mathematics*, Rice University, Houston, TX.

2015–2016 **Postdoctoral Researcher**, *Department of Mathematics*, Virginia Tech, Blacksburg, VA.
- Mentor: Tim Warburton.

2013–2015 **Pfeiffer Postdoctoral Instructor**, *Department of Computational and Applied Mathematics*, Rice University, Houston, TX.
- Mentor: Tim Warburton.

Summer 2011 **Research Assistant**, *Los Alamos National Laboratory*, Los Alamos, NM, XCP-4: Methods and Algorithms.

Research Interests

High order discontinuous Galerkin (DG) methods: I work primarily on high order DG methods for hyperbolic PDEs arising in wave propagation and fluid dynamics. My current work concerns entropy stable DG methods for nonlinear conservation laws. These methods retain robustness and stability at high orders of approximation by ensuring that the numerical solution satisfies a semi-discrete entropy inequality. I have also developed time-domain DG solvers with optimal computational complexity at all polynomial degrees, as well as efficient low-storage implementations of high order DG for heterogeneous media, curved elements, and hybrid meshes.

High performance computing: I am interested in high performance implementations of numerical methods for PDEs, and in designing algorithms which exploit parallelism in modern many-core architectures such as graphics processing units (GPUs). I have also worked on the distributed implementation of high order adaptive finite element methods.

Discontinuous Petrov-Galerkin (DPG) methods: I have worked on the application of high order adaptive DPG methods to problems in fluid dynamics. In particular, I have investigated robust formulations for singularly perturbed convection-diffusion problems, as well as the extension of these methods to the nonlinear equations of compressible flow. I have also worked on preconditioning strategies for DPG methods.

Support and grants

CAREER: Tailored entropy stable discretizations of nonlinear conservation laws (NSF DMS-1943186). 2020-2025, $450k, PI.

Bernstein-Bezier Techniques for High Order Time-Domain Discontinuous Galerkin Methods (NSF DMS-1719818). 2017-2020, $200k, PI.

Collaborative Research: Improved Algorithms for Multiwave Imaging in Complex Media: Theory and Computation (NSF DMS-1712639). 2017-2020, $200k, Co-PI.

Publications (Google Scholar profile)

Bold italicized authors denote supervised students or postdocs.

Submitted

1. Entropy stable reduced order modeling of nonlinear conservation laws. **Jesse Chan**. Link. Submitted to JCP, in revision.
2. A weight-adjusted discontinuous Galerkin method for wave propagation in coupled elastic-acoustic media. ***Kaihang Guo***, Sebastian Acosta, **Jesse Chan**. Link.

Journal publications

1. A weight-adjusted discontinuous Galerkin method for the poroelastic wave equation: penalty fluxes and micro-heterogeneities. ***Khemraj Shukla***, **Jesse Chan**, Maarten V. de Hoop, Priyank Jaiswal. Journal of Computational Physics, Volume 403, Issue 15, 2020. In press: Link.
2. ***Kaihang Guo***, **Jesse Chan**. Bernstein-Bezier weight-adjusted discontinuous Galerkin methods for wave propagation in heterogeneous media. Journal of Computational Physics, Volume 400, Issue 1, 2020. In press: Link
3. **Jesse Chan**, David C. Del Rey Fernandez, Mark H. Carpenter. Efficient entropy stable Gauss collocation methods. SIAM Journal on Scientific Computing, 41.5, A2938–A2966, 2019. Link
4. Skew-symmetric entropy stable discontinuous Galerkin formulations. **Jesse Chan.** Journal of Scientific Computing, Volume 81, Issue 1, 459–485, 2019. Link.
5. Arturo Vargas, Thomas Hagstrom, **Jesse Chan**, T. Warburton. Leapfrog time-stepping for Hermite methods. Journal of Scientific Computing, Volume 80, Issue 1, 289–314, 2019. Link
6. **Jesse Chan**, Lucas Wilcox. Discretely entropy stable weight-adjusted discontinuous Galerkin methods on curvilinear meshes. Journal of Computational Physics, Volume 378, 366-393, 2019. Link
7. **Jesse Chan**. On discretely entropy conservative and entropy stable discontinuous Galerkin methods. Journal of Computational Physics, Volume 362, 346-374, 2018. Link
8. **Jesse Chan**, John Evans. Multi-patch discontinuous Galerkin isogeometric analysis for wave propagation: explicit time-stepping and efficient mass matrix inversion. Computer Methods in Applied Mechanics and Engineering, Volume 333, Pages 22-54, 2018. Link
9. **Jesse Chan**. Weight-adjusted discontinuous Galerkin methods: matrix-valued weights and elastic wave propagation in heterogeneous media. International Journal for Numerical Methods in Engineering 113, 1779-1809, 2018. Link.
10. **Jesse Chan**, T. Warburton. On the penalty stabilization mechanism for upwind discontinuous Galerkin formulations of first order hyperbolic systems. Computers and Mathematics with Applications 74 (12), 3099-3110, 2017. Link
11. Axel Modave, Andreas Atle, **Jesse Chan**, T. Warburton. A GPU-accelerated nodal discontinuous Galerkin method with high-order absorbing boundary conditions and corner/edge compatibility. International Journal for Numerical Methods in Engineering 112 (11), 1659-1686, 2017. Link
12. **Jesse Chan**, Russell J. Hewett, Zheng Wang, T. Warburton. Reduced storage nodal discontinuous Galerkin methods on semi-structured prismatic meshes. Computers and Mathematics with Applications 73.5, 775-793, 2017. Link

13. **Jesse Chan**, Russell J. Hewett and T. Warburton. Weight-adjusted discontinuous Galerkin methods: wave propagation in heterogeneous media. SIAM Journal on Scientific Computing 39.6, A2935-A2961, 2017. Link
14. **Jesse Chan**, Russell J. Hewett and T. Warburton. Weight-adjusted discontinuous Galerkin methods: curvilinear meshes. SIAM Journal on Scientific Computing 39.6, A2395-A2421, 2017. Link
15. Nathan Roberts, **Jesse Chan**. A Geometric Multigrid Preconditioning Strategy for DPG System Matrices. Computers and Mathematics with Applications, 2018-2043, 2017. Link
16. **Jesse Chan** and T. Warburton. GPU-accelerated Bernstein-Bezier discontinuous Galerkin methods for wave problems. SIAM Journal on Scientific Computing 39.2, A628-A654, 2017. Link.
17. A. Vargas, **Jesse Chan**, T. Hagstrom, and T. Warburton. Variations on Hermite methods for wave propagation. Communications in Computational Physics 22.2: 303-337, 2017. Link
18. C. Michoski, **Jesse Chan**, L. Engvall, and J.A. Evans. Foundations of the Blended Isogeometric Discontinuous Galerkin (BIDG) Method. Computer Methods in Applied Mechanics and Engineering, Volume 305, 658-681, 2016. Link
19. **Jesse Chan**, Z. Wang, A. Modave, J.F. Remacle, and T. Warburton. GPU-accelerated discontinuous Galerkin methods on hybrid meshes. Journal of Computational Physics, Volume 318, 142-168, 2016. Link
20. **Jesse Chan** and T. Warburton. A short note on a Bernstein-Bezier basis for the pyramid. SIAM Journal on Scientific Computing, 38(4), A2162-A2172, 2016. Link
21. **Jesse Chan** and T. Warburton. Orthogonal bases for non-affine pyramidal finite elements. SIAM Journal on Scientific Computing 38.2: A1146-A1170, 2016. Link
22. **Jesse Chan** and T. Warburton. hp-finite element trace inequalities for the pyramid. Computers and Mathematics with Applications, 69.6: 510-517, 2015. Link
23. **Jesse Chan** and T. Warburton. A comparison of high order interpolation nodes for the pyramid. SIAM Journal on Scientific Computing, 37:A2151-A2170, 2015. Link
24. **Jesse Chan**, L. Demkowicz, and R. Moser. A DPG method for steady viscous compressible flow. Computers and Fluids, 98:69-90, 2014. Link
25. **Jesse Chan**, J. A. Evans, and W. Qiu. A dual Petrov—Galerkin finite element method for the convection-diffusion equation. Computers and Mathematics with Applications, 68(11):1513-1529, 2014. Link
26. **Jesse Chan**, N. Heuer, T. Bui-Thanh, and L. Demkowicz. A robust DPG method for convection-dominated diffusion problems II: Adjoint boundary conditions and mesh-dependent test norms. Computers and Mathematics with Applications, 67(4):771-795, 2014. Link
27. T. Ellis, L. Demkowicz, and **Jesse Chan**. Locally conservative discontinuous Petrov—Galerkin finite elements for fluid problems. Computers and Mathematics with Applications, 68(11):1530-1549, 2014. Link

Refereed conference proceedings and book chapters

1. Arturo Vargas, **Jesse Chan**, Thomas Hagstrom, T. Warburton. GPU Acceleration of Hermite Methods for the Simulation of Wave Propagation. In: Bittencourt M., Dumont N., Hesthaven J. (eds) Spectral and High Order Methods for Partial Differential Equations ICOSAHOM 2016. Lecture Notes in Computational Science and Engineering, vol 119. Springer, 2017. Link
2. Ellis, Truman, **Jesse Chan**, and Leszek Demkowicz. Robust DPG Methods for Transient Convection-Diffusion. Building Bridges: Connections and Challenges in Modern Approaches to Numerical Partial Differential Equations. Springer International Publishing, 179-203, 2016. Link

Technical reports

1. T. Ellis, L. Demkowicz, **Jesse Chan**, and R. Moser. Space-Time DPG: Designing a Method for Massively Parallel CFD. ICES REPORT 14-32, 2014. Link

2. **Jesse Chan**, J. Gopalakrishnan and L. Demkowicz. Global properties of DPG test spaces for convection-diffusion problems, ICES Report 13-05, 2013. Link
3. **Jesse Chan**, L. Demkowicz and M. Shashkov. Space-time DPG for shock problems, LA-UR 11-05511, 2011.
4. **Jesse Chan**, L. Demkowicz and R. Moser and N. Roberts. A New Discontinuous Petrov-Galerkin Method with Optimal Test Functions. Part V: Solution of 1D Burgers and Navier-Stokes Equations, ICES Report 10-25, 2010. Link
5. **Jesse Chan**, Mark Embree. The network wave equation, CNX report 2008. Link.

Invited presentations

2020 Entropy stable schemes for nonlinear conservation laws: high order discontinuous Galerkin methods and reduced order modeling (Colloquium talk, January 2020, Department of Mathematics, University of Houston, Houston, TX).

2019 Entropy stable schemes for nonlinear conservation laws: high order discontinuous Galerkin methods and reduced order modeling (Colloquium talk, December 2019, Centre for Computational Science and Engineering, Institute for Aerospace Studies, University of Toronto, Toronto, CN).

Entropy stable reduced order modeling for nonlinear conservation laws (Colloquium talk, September 2019, Department of Computational and Applied Mathematics, Rice University, Houston, TX).

Entropy stable schemes for nonlinear conservation laws: high order discontinuous Galerkin methods and reduced order modeling (Seminar talk, September 2019, Oak Ridge National Lab, Oak Ridge, TN).

A discretely entropy stable DG method for the shallow water equations (Minisymposium talk, August 2019, USNCCM 15, Austin, TX).

Entropy stable reduced order modeling for nonlinear conservation laws (Minisymposium talk, July 2019, ICIAM, Valencia, Spain).

Discretely entropy stable discretizations for nonlinear conservation laws: high order finite elements and reduced order modeling, (Invited talk, April 2019, GMIG project review, Houston, TX).

Entropy Stable Schemes Based on Modal Discontinuous Galerkin Formulations, (Minisymposium talk, April 2019, Finite Elements in Flow, Chicago, IL).

Entropy stable Gauss collocation DG methods (Minisymposium talk, March 2019, SIAM Conference on Computational Science and Engineering, Spokane, WA).

2018 Entropy stable schemes based on modal discontinuous Galerkin formulations (Colloquium talk, December 2018, Department of Applied Mathematics, Brown University, Providence, RI).

Discretely entropy stable discontinuous Galerkin methods (Colloquium talk, October 2018, Department of Mathematics, Rensselaer Polytechnic Institute, Troy, NY).

Bernstein-Bezier weight-adjusted discontinuous Galerkin methods for wave propagation in heterogeneous media (Minisymposium talk, October 2018, SIAM TX-LA sectional meeting, Baton Rouge, LA).

Entropy stable high order discontinuous Galerkin methods for nonlinear conservation laws (Colloquium talk, September 2018, Department of Mathematics, Purdue University, West Lafayette, Indiana).

Entropy stable discontinuous Galerkin methods for nonlinear conservation laws (Colloquium talk, August 2018, Department of Mechanical Engineering, Rice University, Houston, TX).

Energy-based methods for time-dependent acoustic and elastic wave propagation (Workshop talk, August 2018, Numerical Analysis of Coupled and Multi-Physics Problems with Dynamic Interface, BIRS Oaxaca, Mexico).

Discretely entropy stable discontinuous Galerkin methods (Minisymposium talk, July 2018, WCCM, New York, New York).

Discretely entropy stable discontinuous Galerkin methods with arbitrary bases and quadratures (Minisymposium talk, July 2018, ICOSAHOM, London, United Kingdom).

Weight-adjusted discontinuous Galerkin methods for elastic wave propagation (Minisymposium talk, July 2018, ICOSAHOM, London, United Kingdom).

Discretely entropy stable discontinuous Galerkin methods (Minisymposium talk, June 2018, ECCM-ECFD, Glasgow, United Kingdom).

Discretely stable high order methods for nonlinear conservation laws, (Seminar talk, May 2018, Department of Mathematics, Virginia Tech, Blacksburg, VA).

Discretely entropy stable high order methods for nonlinear conservation laws, (Seminar talk, May 2018, NASA Langley Research Center, Hampton, VA).

Simulating waves and fluids: accuracy, stability, and high performance computing, (Invited talk, May 2018, Ken Kennedy Institute, Houston, TX).

Discretely stable high order DG methods, (Seminar talk, April 2018, Department of Mathematics, Texas A&M, College Station, TX).

Discretely entropy stable discontinuous Galerkin methods (Minisymposium talk, January 2018, Joint Mathematics Meetings, San Diego, CA).

2017 Provably stable high order discontinuous Galerkin methods for wave propagation and fluid flow (Seminar talk, November 2017, Fluid Dynamics Research Consortium, Pennsylvania State University, University Park, PA).

Discretely entropy stable discontinuous Galerkin methods (Seminar talk, October 2017, Department of Mathematics, University of Houston, Houston, TX).

Discretely entropy stable discontinuous Galerkin methods (Symposium talk, September 2017, Texas Applied Mathematics and Engineering Symposium, Austin, TX).

Bernstein-Bezier discontinuous Galerkin methods (Minisymposium talk, June 2017, 27th Biennial Numerical Analysis Conference, Glasgow, Scotland).

Efficient time-domain discontinuous Galerkin methods for wave propagation (ICES seminar, March 2017, University of Texas at Austin, Austin, TX).

Weight-adjusted discontinuous Galerkin methods for heterogeneous media and curvilinear meshes (SIAM Conference on Computational Science and Engineering, February 2017, Atlanta, GA).

2016 Finite Element and GPU Computing Seminar: the Bernstein-Bezier Discontinuous Galerkin method (Guest lecture, October 2016, Virginia Tech, Blacksburg, VA).

Efficient time-domain DG methods for wave propagation (Seminar talk, October 2016, Department of Mathematics, Southern Methodist University, Dallas, TX).

Efficient time-domain DG methods for wave propagation, (Seminar talk, July 2016 Department of Mathematics, Texas A&M, College Station, TX).

GPU-accelerated Bernstein-Bezier DG methods (Seminar talk, April 2016, Synergistic Environments for Experimental Computing seminar, Virginia Tech, Blacksburg, VA).

Recursive structures in Bernstein-Bezier matrices (Seminar talk, March 2016, Matrix Computations seminar, Virginia Tech, Blacksburg, VA).

GPU-accelerated Bernstein-Bezier discontinuous Galerkin methods (Seminar talk, February 2016, SIAM student chapter, Virginia Tech, Blacksburg, VA).

Designing Discontinuous Galerkin methods for high order efficiency (Seminar talk, February 2016, Department of Mathematics, University of Kansas, Lawrence, KS).

Designing Discontinuous Galerkin methods for high order efficiency (Seminar talk, January 2016, Department of Computational and Applied Mathematics, Rice University, Houston, TX).

Designing Discontinuous Galerkin methods for high order efficiency (Seminar talk, January 2016, Department of Mathematics, Baylor University, Waco, TX).

2015 GPU-accelerated DG methods on hybrid meshes (Seminar talk, November 2015, Department of Mathematical Sciences, University of Delaware, Newark, Delaware).

GPU-accelerated high order DG methods on hybrid meshes (Seminar talk, November 2015, TU Wien, Vienna, Austria).

DPG for the compressible Navier-Stokes equations (Workshop talk, November 2015, Workshop on Minimum Residual and Least Squares Finite Element Methods, Delft, Netherlands).

GPU-accelerated DG Methods on Hybrid Meshes (Workshop talk, September 2015, MFO 1540, Oberwolfach, Germany).

GPU-accelerated high order DG Methods on Hybrid Meshes (Seminar talk, September 2015, Department of Mathematics, Virginia Tech, Blacksburg, VA)

High order discontinuous Galerkin methods on hybrid meshes (Minisymposium talk, July 2015, SIAM Geosciences 15, Palo Alto, CA).

High order discontinuous Galerkin methods on pyramidal elements (Minisymposium talk, April 2015, PANACM, Buenos Aires, AR).

2013 DPG methods for convection-diffusion (Workshop talk, ICES/USACM Workshop on Minimum Residual and Least Squares Finite Element Methods, Austin, TX.)

Dual Petrov-Galerkin methods: an overview of theory/applications (Seminar talk, Department of Computational and Applied Mathematics, Rice University, Houston, TX).

A higher order DPG method for compressible flow problems (Seminar talk, Department of Computational and Applied Mathematics, Rice University, Houston, TX).

DPG Methods for Transport and the Inviscid Euler Equations (SIAM CSE, Boston, MA, 2013)

2012 A Discontinuous Petrov-Galerkin method for compressible flow problems (Seminar talk, The Boeing Company, Seattle, WA.)

2011 Application of a Discontinuous Petrov-Galerkin method to compressible flow problems (Minisymposium talk, ECCOMAS, Vienna, Austria).

Contributed presentations

2019 Modal formulations of entropy stable discontinuous Galerkin methods (Minisymposium talk, June 2019, North American High Order Methods Conference, San Diego, CA).

2018 Efficient explicit solvers for multipatch discontinuous Galerkin isogeometric analysis (Minisymposium talk, June 2018, ECCM-ECFD, Glasgow, United Kingdom).

Weight-adjusted Bernstein-Bezier DG methods for wave propagation in heterogeneous media (Rice Oil and Gas HPC Conference, March 2018, Houston, TX).

Discretely entropy stable discontinuous Galerkin methods (Finite Element Rodeo, February 2018, Baton Rouge, LA).

2017 Time-domain multi-patch discontinuous Galerkin methods (Minisymposium talk, USNCCM 14, July 2017, Montreal, CA).

Weight-adjusted discontinuous Galerkin methods for acoustic and elastic wave propagation (Minisymposium talk, WAVES, May 2017, Minneapolis, MN).

Weight-adjusted discontinuous Galerkin methods for acoustic and elastic wave propagation (Rice Oil and Gas HPC Conference, March 2017, Houston, TX).

2016 GPU-accelerated DG methods at high order (Minisymposium talk, Rice Oil and Gas HPC Conference, March 2016, Rice University, Houston, TX).

GPU-accelerated Bernstein-Bezier DG methods (Minisymposium talk, ICSCA, June 2016, Toronto, Canada).

GPU-accelerated Bernstein-Bezier DG methods for wave problems (Monash Workshop on Numerical PDEs, February 2016, Monash University, Melbourne, Australia).

2015 High order discontinuous Galerkin methods on pyramidal elements (Minisymposium talk, SIAM CSE15, March 2015, Salt Lake City, UT).

2014 Dual Petrov-Galerkin methods for convection problems (Finite Element Rodeo, March 2014, Austin, TX)

2013 A higher order adaptive DPG method for compressible flow problems (Minisymposium talk, USNCCM, Raleigh, NC)

DPG: A Robust, Higher Order Adaptive Method for Convection-dominated Diffusion Problems (Minisymposium talk, FEMTEC, Las Vegas, NV)

2012 Application of a Discontinuous Petrov-Galerkin method to convection-diffusion problems (Finite Element Rodeo, Houston, TX)

2011 Application of a Discontinuous Petrov-Galerkin Method to the Euler and Navier-Stokes Equations (Minisymposium talk, USNCCM, Minneapolis, MI.)

Posters

2019 A discontinuous Galerkin method for wave propagation in coupled elastic-acoustic media (Guo, K., and Chan, J.). Poster, Rice Oil and Gas HPC conference.

2018 GPU-accelerated Bernstein-Bezier weight-adjusted DG methods for wave propagation in heterogeneous media (Guo, K., and Chan, J.). Poster, SIAM LA-TX sectional meeting.

2018 GPU-accelerated Bernstein-Bezier weight-adjusted DG methods for wave propagation in heterogeneous media (Guo, K., and Chan, J.). Poster, Rice Oil and Gas HPC conference.

2016 GPU Accelerated Discontinuous Galerkin Method on Hybrid Meshes: Applications in Seismic Imaging (Wang, Z., Chan, J. L., Modave, A., and Warburton, T.). Poster, Rice Oil and Gas HPC conference.

GPU Accelerated Hermite Methods for the Simulation of Waves (Vargas, A., Chan, J. L., and Warburton, T.). Poster, Rice Oil and Gas HPC Conference.

2015 Efficient DG Methods on Hybrid Meshes (Invited workshop poster, Polytopal Element Methods in Mathematics and Engineering, Atlanta, Georgia).

Conference and workshop participation

2019 Workshop on Scientific machine learning (ICERM)

2017 Scientific software days (University of Texas at Austin)

Finite element rodeo (University of Houston)

2016 Finite element circus (University of Maryland)

Teaching experience

Numbers in parentheses correspond to 1 for "Outstanding" and 5 for "Poor".

Rice University

Spring 2020 **Discontinuous Galerkin methods (CAAM 542)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics.

Fall 2019 **Numerical analysis (CAAM 553)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics.

Spring 2019 **Computational Science II (CAAM 520)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics.

Fall 2018 **Numerical analysis (CAAM 553)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics, (Instructor effectiveness: 1.0, Rice Mean 1.68).

Spring 2018 **Matrix Analysis (CAAM 335)**, *Undergraduate course*, Rice University, Department of Computational and Applied Mathematics, Lead instructor of a 3 section course (Instructor effectiveness: 1.85, Rice Mean 1.66).

Spring 2018 **Topics in numerical differential equations (CAAM 652)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics, (Instructor effectiveness: 1.43, Rice Mean 1.7).

Fall 2017 **Numerical analysis (CAAM 553)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics, (Instructor effectiveness: 2.14, Rice Mean 1.73).

Spring 2017 **Fundamentals of finite element methods (CAAM 552)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics, (Instructor effectiveness: 1.0, Rice mean: 1.723).

Fall 2016 **Numerical analysis (CAAM 553)**, *Graduate course*, Rice University, Department of Computational and Applied Mathematics, (Instructor effectiveness: 1.43, Rice mean: 1.73).

Spring 2015 **Differential Equations in Science and Engineering (CAAM 336)**, *Undergraduate course*, Rice University, Department of Computational and Applied Mathematics, Lead instructor of a 2 section course, (Instructor effectiveness: 1.32, Rice mean: 1.78).

Fall 2014 **Differential Equations in Science and Engineering (CAAM 336)**, *Undergraduate course*, Rice University, Department of Computational and Applied Mathematics, (Instructor effectiveness: 1.35, Rice mean: 1.77).

Spring 2013 **Matrix Analysis (CAAM 335)**, *Undergraduate course*, Rice University, Department of Computational and Applied Mathematics, (Instructor effectiveness: 1.82, Rice mean: 1.75).

Fall 2013 **Teaching assistant**, *Rice University, Department of Computational and Applied Mathematics*.

- Matrix Analysis (CAAM 335), undergraduate course.
- Computational Science I (CAAM 420), graduate course.

University of Texas at Austin

Spring 2012 **Teaching Assistant**, *The University of Texas at Austin*, Institute for Computational Engineering and Sciences.

- Mathematical Models in Applied Engineering and Sciences (CAM386L), graduate course.

PhD and MA students

2017-present **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Kaihang Guo, Masters/PhD student in CAAM.

2019-present **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Philip Wu, Masters/PhD student in CAAM.

Other mentoring experience

2019-present **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Mario Bencomo, Pfieffer postdoctoral researcher in CAAM.

2019-present **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Kyle Busse, Masters student in CAAM.

Summer 2019 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Jacob Engel, Rice University undergraduate.

2018 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Nigel Tan, Rice University MCAAM student.

Summer 2018 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Matthew Schwartz, Rice University undergraduate.

Summer 2018-present **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Khemraj Shukla, Visiting PhD student (with Maarten V. de Hoop)

2017-2018 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Undergraduate senior design team: Sanket Mehta, Meghana Pannala, Kyungnam Kim (2017 only).

Summer 2017 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Joey Munar, Rice undergraduate.

Spring 2017 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Eva (Chen) Chen, Rice undergraduate.

2014–2016 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Co-mentored Zheng Wang (with advisor T. Warburton), PhD student in CAAM.

2014–2016 **Rice University**, Department of Computational and Applied Mathematics, Houston, TX.
Co-mentored Arturo Vargas (with advisor T. Warburton), PhD student in CAAM.

Software

2020 **JuliaDG**, *Dept. of Comp. and Applied Mathematics*, Rice University, Houston, TX.

JuliaDG, Julia implementation of energy and entropy stable high order DG methods in 1D, 2D, 3D for linear and nonlinear PDEs. Companion code to Spring 2020 course CAAM 542 (Discontinuous Galerkin methods).

2018 **BBWADG**, *Dept. of Comp. and Applied Mathematics*, Rice University, Houston, TX.

BBWADG, GPU-accelerated implementation of time-domain solvers for acoustic and elastic waves using Bernstein-Bezier weight-adjusted DG methods (with Kaihang Guo).

2015 **BBDG**, *Dept. of Mathematics*, Virginia Tech, Blacksburg, VA.

BBDG, a GPU-accelerated high order DG code using Bernstein-Bezier basis functions on unstructured tetrahedral meshes (with Tim Warburton).

2014–2015 **Nodes**, *Dept. of Comp. and Applied Mathematics*, Rice University, Houston, TX.

Nodes, a library of routines to compute optimized interpolation nodes for high order Lagrange finite elements (with Tim Warburton).

2010–2013 **Camellia**, *Institute for Computational Engineering and Sciences (ICES)*, The University of Texas, Austin, TX.
Contributor to Camellia, a high order adaptive MPI code developed by Nathan Roberts and built upon the Sandia Trilinos library.

University activities, service, and outreach

2019 Oil and Gas HPC Conference: organizing committee
2019 Orientation week, August 2019: academic fair
2019 commencement, May 2019: graduate marshal
2019 undergraduate recruiting, April 2019: Owl Days reception
2018 CEVE department: faculty search committee
2018 Orientation week, August 2018: academic fair
2018 commencement, May 2018: graduate marshal
2018 undergraduate recruiting, April 2018: Owl Days reception
2017 Orientation week, August 2017: academic fair
2017 commencement, May 2017: graduate marshal
2017 convocation, May 2017: doctoral hooding
2017 undergraduate recruiting, April 2017: Owl Days reception
2013–present Will Rice College Associate.

Departmental service

2019 Undergraduate committee
2019 Lecturer hiring committee
2018 Data Science Initiative recruiting
2018 Graduate student recruiting
2017-2019 Graduate committee
2017-present Qualifying examination committee
2017 Graduate student recruiting
2017 Faculty search committee
2016-2019 Colloquium chair.

Professional service

2019-2020 SIAM Education Committee: webpage subcommittee

2019-present Faculty mentor for Rice University student chapter of SIAM

2019 USNCCM 15: minisymposium co-organizer

2019 SIAM Computational Science and Engineering: featured two-session minisymposium co-organizer.

2018 Proposal reviewer for Chilean National Science and Technology Commission (CONICYT)

2018 NSF proposal review panelist.

2018 World Congress on Computational Mechanics, July 2018: 3-session minisymposium co-organizer.

2017 Texas Applied Math and Engr. Symposium, September 2017: poster session judge.

2017–present SIAM Computational Science and Engineering: two-session minisymposium co-organizer, poster session judge.

2012–present Reviewer for: SMAI Journal of Computational Mathematics, Transactions on Magnetics - Conferences, SIAM/ASA Journal on Uncertainty Quantification, SIAM Journal on Numerical Analysis, Computational Mechanics, Journal of Computational Science, Journal of Scientific Computing, Journal of Computational Physics, Computers and Mathematics With Applications, SIAM Journal on Scientific Computing, Mathematical Modelling and Numerical Analysis, International Journal of High Performance Computing, Computer Physics Communications, Computer Methods in Applied Mechanics and Engineering, Applied Numerical Mathematics.

2006–2008 Secretary, Rice University student chapter of SIAM.

Community service and outreach

2020 Faculty speaker at ConocoPhillips Applied Mathematics Program (AMP)

2019 Faculty speaker at ConocoPhillips Applied Mathematics Program (AMP)

2018 Greater Houston Community Foundation Family Philanthropy Day volunteer

2018-2019 Greater Houston Community Foundation Scholarship reviewer

2017 Community service volunteer with St. Martin's Episcopal Church

2010–2013 Chair/co-organizer of the UT Austin ICES Forum/Babuška Seminar Series. Worked with Dr. Ivo Babuška to organize a bi-weekly seminar series aimed at exposing graduate students to a wide variety of scientific areas and applications.

2010–2012 Volunteer math coach with Austin Partners in Education.

PhD committees

2019 (Proposal) Christopher Thiele, Computational and Applied Mathematics, Rice University

2019 Khemraj Shukla, Boone Pickens School of Geology, Oklahoma State University

2019 (Proposal): Yabin Zhang, Computational and Applied Mathematics, Rice University

2019 Kaipeng Li, Electrical and Computer Engineering, Rice University

2019 Thomas Klotz, Computational and Applied Mathematics, Rice University

2019 Peter Geldermans, Computational and Applied Mathematics, Rice University

2018 (Proposal): Thomas Klotz, Computational and Applied Mathematics, Rice University

2018 (Proposal): Kaipeng Li, Electrical and Computer Engineering, Rice University

2018 Ruichao Ye, Computational and Applied Mathematics, Rice University

2017 Wanli Cheng, Mathematics, University of Houston

MA committees

2019 Shengchao Lin, Computational and Applied Mathematics, Rice University

2019 Mae Markowski, Computational and Applied Mathematics, Rice University

2019 Rami Masri, Computational and Applied Mathematics, Rice University

2019 Connie Do, Civil and Environmental Engineering, Rice University

2018 Nick Bell, Computational and Applied Mathematics, Rice University

2018 Jonas Actor, Computational and Applied Mathematics, Rice University

2018 Christopher Thiele, Computational and Applied Mathematics, Rice University

2017 Peter Geldermans, Computational and Applied Mathematics, Rice University

2017 Jeremy Tillay, Computational and Applied Mathematics, Rice University

Awards and honors

2020 **ICERM semester program:** travel support ("Model and dimension reduction in uncertain and dynamic systems")

2019 **ICERM workshop:** travel support ("Scientific Machine Learning")

2015 **Oberwolfach Institute for Mathematics:** US Junior Oberwolfach Fellow.

2015 **Workshop on polytopal element methods:** travel award.

2013–2015 **Rice University:** Pfeiffer Postdoctoral Fellowship

2013 **UT Austin:** Graduate School Professional Development Travel Award

2008–2012 **UT Austin:** Computational and Applied Mathematics Fellowship

2004–2008 **Rice University.:** National Merit Scholarship, Chevron-Texaco REACH Scholarship, Louis J. Walsh Scholarship in Engineering

2007 **Rice University:** Meritorious Winner, Mathematical Competition in Modeling

Fall 2004, Spring 2006 **Rice University:** President's Honor Roll

References available upon request.