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EDUCATION

2001–2006	*Rice University, Department of Computational and Applied Mathematics (CAAM)* Doctor of Philosophy (GPA 4.03/4.00). Thesis: Trust-Region SQP Methods With Inexact Linear System Solves For Large-Scale Optimization. Advisor: Matthias Heinkenschloss.
1997–2001	*Indiana University-Purdue University at Indianapolis (IUPUI)* Bachelor of Science with Highest Distinction (GPA 3.99/4.0). Major: Mathematics. Minor: Computer Science.
1996–1997	*Friedrich-Alexander Universität Erlangen-Nürnberg, Germany* Major: Mathematics.

PROFESSIONAL EXPERIENCE

2024 – Present	*Distinguished Member of Technical Staff,* Optimization and Uncertainty Quantification Department, Sandia National Labs, Albuquerque, NM.
2013 – 2024	*Principal Member of Technical Staff,* Optimization and Uncertainty Quantification Department, Sandia National Labs, Albuquerque, NM.
2008 – 2013	*Senior Member of Technical Staff,* Optimization and Uncertainty Quantification Department, Sandia National Labs, Albuquerque, NM.
2006 – 2008	*John von Neumann Postdoctoral Research Fellow,* Computational Mathematics and Algorithms and Optimization and Uncertainty Quantification Departments, Sandia National Labs, Albuquerque, NM.
May–Aug. 2005	*Summer Intern,* Optimization and Uncertainty Quantification Department, Sandia National Labs, Albuquerque, NM.
Jan.–May 2005	*Instructor of Record,* CAAM Department, Rice University, Houston, TX.
May–Aug. 2004	*Summer Intern,* Optimization and Uncertainty Quantification Department, Sandia National Labs, Albuquerque, NM.
Jan.–May 2003	*Teaching Assistant,* CAAM Department, Rice University, Houston, TX.

SELECT AWARDS AND HONORS

2023	R&D 100 Award. Meta Optics Studio: Software package for the design, simulation, and optimization of flat electromagnetic meta-surfaces. *Lead of HPC capability for extreme-scale mesh generation, simulation and PDE-constrained optimization.*
2019	Cluster Chair for PDE-constrained Optimization and Optimal Control, 6th International Conference on Continuous Optimization, Berlin, Germany.
2019	R&D 100 Award. MIRAGE: Software package for multiscale inverse group theory for engineered meta-materials. *Lead of the time-domain electromagnetic modeling, simulation and optimization capability.*
2014–2020	Chair of the John von Neumman Postdoctoral Research Fellowship in Computational Science Selection Committee, Sandia National Labs.
2013–2019	Associate Editor, SIAM Journal on Numerical Analysis.

2014	Award for Excellence, for *leading the release of the Rapid Optimization Library and its delivery to research and production missions*, Sandia National Labs.
2013	Award for Excellence, for *delivering new optimization algorithms and software and coupling them to SIERRA-SD, enabling first-of-its-kind characterization of vibrational environments for the B61 LEP*, Sandia National Labs.
2006–2008	John von Neumann Postdoctoral Research Fellowship, Sandia National Labs.
2001–2005	Presidential Fellowship, Rice University.
2001 and 2004	George R. Brown Fellowship, Rice University.
2001	Chancellor's Scholar, IUPUI Purdue School of Science.
2000	Chair's Special Recognition Award, IUPUI Department of Mathematics, for achievements at the 60th annual W. L. Putnam Mathematical Competition.
1998–1999	Anna K. Suter Memorial Scholarship, IUPUI Department of Mathematics.
1997–1998	Scholar of the "Studienstiftung des Deutschen Volkes", The German National Academic Foundation.

RESEARCH INTERESTS

Numerical optimization: algorithm development, analysis and implementation.

Partial differential equations: advanced discretizations for hyperbolic systems and electromagnetics.

Scientific software development: performance-portable and scalable implementations of numerical optimization algorithms through modern C++ programming.

High-performance computing: low-memory parallel computing through data compression, mixed-precision architectures for numerical optimization, extreme-scale PDE-constrained optimization.

Applications: optimal control, optimal design, inverse problems, imaging, additive manufacturing.

SCIENTIFIC SOFTWARE DEVELOPMENT

Rapid Optimization Library (ROL), Project Lead `https://rol.sandia.gov`

ROL is a high-performance C++ library for numerical optimization. ROL brings an extensive collection of state-of-the-art optimization algorithms to virtually any application. Its programming interface supports any computational hardware, including heterogeneous many-core systems with digital and analog accelerators.

Intrepid, Lead Developer `https://github.com/trilinos/Trilinos`

Intrepid is a Trilinos library of PDE discretization tools, enabling an element-level mix-and-match approach to implementing compatible and high-order finite element and finite volume methods for the solution of PDEs, including the models of structural mechanics, fluid dynamics and electromagnetics.

$(FEM)^3$: Finite Element Modeling for Electromagnetics for Exascale Machines, Project Lead

$(FEM)^3$ is an HPC application for the solution of time-dependent Maxwell's equations, built using Trilinos components, such as Intrepid2 (discretizations), Tpetra and Kokkos (performance-portable linear algebra) and MueLu (multigrid solvers). $(FEM)^3$ provides the HPC engine for the MIRAGE project and software (`https://mirage-software.com/`), including Meta Optics Studio for metalens design.

FIVE-YEAR RESEARCH & DEVELOPMENT HIGHLIGHTS

Project Lead for ROL

Leading a team of algorithm and software experts (Robert Baraldi, Aurya Javeed, Drew Kouri, Greg von Winckel and Radoslav Vuchkov) to develop a performance-portable C++ library of state-of-the-

art numerical optimization methods.

Advancing digital engineering at Sandia through modern optimization algorithms that are fully embedded in Advanced Scientific Computing codes such as SIERRA-SD (structural dynamics), PLATO (shape and topology optimization), Aria (heat transfer), Xyce (electrical circuits), EMPIRE (electromagnetics, plasma) and Sparc (computational fluid dynamics).

HPC Capability Lead for the MIRAGE Project on Electromagnetic Metamaterials

Leading a team of Sandia researchers (Edgar Bustamante, Ernesto Prudencio and Tim Wildey) to develop extreme-scale modeling, simulation and optimization of time-domain Maxwell's equations, tailored to the design of optical metamaterials.

Developed domain decomposition approach with tunable accuracy and asynchronous scheduling.

Performed groundbreaking simulations of a centimeter-sized metamaterial lens, which capture electromagnetic interactions at the nanoscale, involving 100s of billions of finite elements.

As part of the government team for the DARPA-ENVision program, supported the development of next-generation night-vision systems, including site visit to Naval Surface Warfare Center, Crane, IN.

Initiated a semester-long seminar on Optimal Control of Maxwell's Equations with collaborators from George Mason University (Harbir Antil, Rohit Khandelwal and Yaw Owusu-Agyemang) and Southern Methodist University (Jimmie Adriazola).

Project awards: R&D 100 Awards in 2019 and 2023, 2020 Laser Focus World Innovator Award, 2021 Excellence in Technology Transfer Award from the Mid-Continent Region of the Federal Laboratory Consortium for Technology Transfer (FLC).

Project Lead for Distributed-in-time Techniques for Optimization at Extreme Scales LDRD, 2018-2021

Led a team of eight Sandia researchers and three collaborators from Rice University (Matthias Heinkenschloss, Nathaniel Kroeger and Shengchao Lin).

Developed three classes of matrix-free methods for parallel-in-time optimization of engineering models, enabling major computational speedups on modern HPC architectures.

Demonstrated new methods and software on applications in heat transfer, fluid dynamics, electromagnetics and trajectory optimization.

Project output: 4 papers, >20 presentations, follow-on funding, Parapint software, ROL Dynamic API.

Project Lead for R-adaptivity to Enable Compression of Elementary Computations Extreme-scale Finite Element Simulators LDRD, 2023-2024

Developed novel mesh optimization techniques, based on matrix-free trust-region sequential quadratic programming (SQP) methods, to overcome memory limitations of finite element simulators, by enhancing and exploiting redundancy through r-adaptivity based on element similarity.

Demonstrated 10-billion finite element simulations on a *single* commodity workstation (HPC node), advancing the state of the art by a factor of 20.

Team Member, Analog Systems for Edge Optimization LDRD, 2022-2025

Developed high-precision optimal control methods that robustly and efficiently use low-power low-precision analog computational kernels, with potential applications to guidance and navigation systems in, e.g., satellites and unmanned aerial vehicles.

Extended trust-region SQP methods to handle inexact matrix-vector multiplication in its key computational kernels.

Team Member, Smart Hypersonics with Optimized Real-Time Information and Ephemeris LDRD, 2021-2024

Developed new Fast Fourier Transform (FFT) based approaches to trajectory optimization, featuring Nlog(N) computational complexity and enabling real-time on-board trajectory calculations, through the use of matrix-free trust-region SQP methods.

Developed a new preconditioner for the integration matrices arising in spectral collocation methods, featuring linear complexity.

PROFESSIONAL ACTIVITIES AND SERVICE

Conference organizer, workshop organizer, conference cluster chair

Annual East Coast Optimization Meeting (ECOM), `http://math.gmu.edu/~hantil/ECOM/2023`
Fourth meeting (virtual): April 13–14, 2023
George Mason University, Fairfax, VA
Co-organizers: Harbir Antil (George Mason University) and Drew Kouri (Sandia Labs).

Annual East Coast Optimization Meeting (ECOM), `http://math.gmu.edu/~hantil/ECOM/2022`
Third meeting (virtual): March 31–April 1, 2022
George Mason University, Fairfax, VA
Co-organizers: Harbir Antil (George Mason University) and Drew Kouri (Sandia Labs).

Annual East Coast Optimization Meeting (ECOM), `http://math.gmu.edu/~hantil/ECOM/2021`
Second meeting (virtual): April 1–2, 2021
George Mason University, Fairfax, VA
Co-organizers: Harbir Antil (George Mason University) and Drew Kouri (Sandia Labs).

Chair, Cluster for PDE-constrained Optimization and Optimal Control, `https://iccopt2019.berlin`
Sixth International Conference on Continuous Optimization (ICCOPT 2019)
Berlin, Germany, August 3–8, 2019
Co-chair: Juan Carlos De los Reyes (Escuela Politécnica Nacional de Ecuador).
Coordinated 30 mini-symposia with approximately 100 talks.

Annual East Coast Optimization Meeting (ECOM), `http://math.gmu.edu/~hantil/ECOM/2019`
Inaugural meeting: April 4–5, 2019
George Mason University, Fairfax, VA
Co-organizers: Harbir Antil (George Mason University) and Drew Kouri (Sandia Labs),
Goal: *Introduce students and early-career researchers to the current trends in optimization and create a strong networking environment among academia, industry, and the national laboratories.*

Frontiers in PDE-constrained optimization, `https://doi.org/10.1007/978-1-4939-8636-1`
Minneapolis, MN, June 6–10, 2016
Institute for Mathematics and its Applications (IMA)
Co-organizers: Martin-D. Lacasse (ExxonMobil), Harbir Antil (George Mason University) and Drew Kouri (Sandia Labs).
Goal: *Present tutorials for students and early-career researchers, focused on state-of-the-art algorithms and software for PDE-constrained optimization. Provide networking opportunities, by hosting research talks, given by academia, industry, national labs and government agencies*.

Conference mini-symposium organizer

16th World Congress on Computational Mechanics (WCCM 2024)
Vancouver, BC, Canada, July 2024
Mini-symposium: Modern Structure-Preserving Methods for PDEs.
Co-organizers: Brendan Keith (Brown University), Marta D'Elia (Pasteur Labs) and Nat Trask (University of Pennsylvania).

17th U.S. National Congress on Computational Mechanics (USNCCM17)
Albuquerque, NM, July 2023
Mini-symposium: Recent Advances in Large-Scale Optimal Engineering Design.
Co-organizers: Brendan Keith (Brown University), Harbir Antil (George Mason University), Boyan Lazarov (Lawrence Livermore National Lab) and Drew Kouri (Sandia Labs).

17th U.S. National Congress on Computational Mechanics (USNCCM17)
Albuquerque, NM, July 2023
Mini-symposium: Advances in Novel Property-Preserving Methods for Hyperbolic Problems.
Co-organizers: Pavel Bochev (Sandia Labs) and Dmitri Kuzmin (TU Dortmund).

SIAM Conference on Optimization (OP23)
Seattle, WA, June 2023
Mini-symposium: Applications in Dynamic Optimization and Games.
Co-organizers: Harbir Antil (George Mason University) and Drew Kouri (Sandia Labs).

7th International Conference on Continuous Optimization (ICCOPT)
Bethlehem, PA, July 2022
Mini-symposium: Algorithmic Advances in Applications of PDE Constrained Optimization.
Co-organizers: Harbir Antil (George Mason University) and Drew Kouri (Sandia Labs).

7th International Conference on Continuous Optimization (ICCOPT)
Bethlehem, PA, July 2022
Mini-symposium: Scalable and Performance-Portable Optimization with Trilinos.

23rd International Symposium on Mathematical Programming (ISMP2018)
Bordeaux, France, July 2018
Mini-symposium: Advances in optimization methods for time dependent problems.

SIAM Conference on Uncertainty Quantification (UQ18)
Garden Grove, CA, April 2018
Mini-symposium: Exploiting structure in optimization under uncertainty.
Co-organizers: Harbir Antil (George Mason University), Thomas Surowiec (Philipps Universität Marburg) and Drew Kouri (Sandia Labs).

9th International Conference on Large–Scale Scientific Computations
Sozopol, Bulgaria, June 2013
Special session: Theoretical and Algorithmic Advances in Transport Problems.
Co-organizer: Pavel Bochev (Sandia Labs).

8th International Conference on Large–Scale Scientific Computations
Sozopol, Bulgaria, June 2011
Special session: Advanced Methods for Transport.
Co-organizer: Pavel Bochev (Sandia Labs).

7th International Conference on Large–Scale Scientific Computations
Sozopol, Bulgaria, June 2009
Special session: Unconventional Uses of Optimization in Scientific Computing.
Co-organizer: Pavel Bochev (Sandia Labs).

SIAM Conference on Computational Science and Engineering
Costa Mesa, CA, February 2007
Mini-symposium: Numerical Algorithms for PDE–Constrained Optimization.
Co-organizer: Matthias Heinkenschloss (Rice University).

Reviewer for journals

SIAM Journal on Optimization

Mathematical Programming

Optimization Methods and Software
Computational Optimization and Applications
Optimization and Engineering
Optimization Letters
Journal of Optimization Theory and Applications
SIAM Journal on Numerical Analysis
Journal of Computational Physics
SIAM Journal on Scientific Computing
SIAM Journal on Matrix Analysis and Applications
ACM Transactions on Mathematical Software
Computers and Mathematics with Applications
Journal of Scientific Computing
Computer Physics Communications

MENTORING, TEACHING AND TALENT DEVELOPMENT

Summer students and postdocs (in reverse chronological order)

Yaw Owusu-Agyemang (George Mason University), summer student
Falko Ruppenthal (TU Dortmund), summer student
Aurya Javeed (Sandia Labs), postdoc
Kelsey DiPietro (Sandia Labs; GE HealthCare), postdoc
Scott Moe (AMD; Microsoft), summer student
Mona Hajghassem (University of Baltimore; Montgomery College), summer student
Timur Takhtaganov (Cadence Design Systems), summer student
Xiaodi Deng (Quantlab), summer student
Drew Kouri (Sandia Labs), summer student
Jedidiah Gohlke (Aucerna), summer student
Miguel Aguiló (Sandia Labs; Morphorm), postdoc
Nate Roberts (Sandia Labs), summer student
Joseph Young (Sandia Labs; Optimojoe), postdoc
Matthew Keegan (Akamai Technologies), summer student

Teaching and talent development

Optimization Seminar, George Mason University, January 2024
Mini-course on **Trust-region methods with inexact and adaptive computations**.

Thesis committee, George Mason University, 2020-2021
Deepanshu Verma, Optimal Control Problems Constrained by Fractional PDEs and Applications to Deep Neural Networks.

IMA Workshop Frontiers in PDE-constrained Optimization, Minneapolis, MN, June 2016
Two-hour lecture on **Algorithms and software for PDE-constrained optimization**.

CAAM Department, Rice University, Houston, TX, January-May 2005
Instructor for the course CAAM 335, **Matrix Analysis**. Applied matrix analysis and linear algebra, complex variables and applications.

CAAM Department, Rice University, Houston, TX, January-May 2003
Teaching assistant for the course CAAM 336, **Differential Equations** in Science and Engineering. Numerical methods for ordinary and partial differential equations.

Department of Mathematics, Indiana University Purdue University at Indianapolis (IUPUI), Indianapolis, IN, January-May 2001
Instructor for a course on **general problem solving**, for advanced high school students participating in mathematical competitions.

PUBLICATIONS

Recently completed articles

- R. Baraldi, D. P. Kouri, and D. Ridzal. Trust-region methods with inexact and adaptive computations. In *Encyclopedia of Optimization*, 2023. Accepted.
- A. Javeed, D. Kouri, D. Ridzal, and I. M. Ross. A fast matrix-free method for low-thrust trajectory optimization. 2023.
- R. Vuchkov, E. C. Cyr, and D. Ridzal. Multigrid-in-time preconditioners for KKT systems, 2024. https://arxiv.org/abs/2405.04808.
- K. DiPietro and D. Ridzal. Efficient optimization-based multigrid-enabled solver for the Monge-Ampère equation. 2023.

Books and peer-reviewed book chapters

- H. Antil, D. P. Kouri, M.-D. Lacasse, and D. Ridzal. *Frontiers in PDE-constrained Optimization*. Number 163 in The IMA Volumes in Mathematics and its Applications. Springer New York, 2018.
  Book Review: SIAM Review Vol. 61, Issue 4 (December 2019).
- D. P. Kouri and D. Ridzal. Inexact trust-region methods for PDE-constrained optimization. In *Frontiers in PDE-Constrained Optimization*, pages 83–121. Springer New York, 2018.
- P. Bochev, D. Ridzal, G. Scovazzi, and M. Shashkov. Constrained-optimization based data transfer: a new perspective on flux correction. In *Flux-Corrected Transport: Principles, Algorithms, and Applications*, pages 345–398. Springer Netherlands, 2012.
- R. C. Chin and D. Ridzal. Generating orthogonal polynomials for exponential weights on a finite interval. In *Special Functions*, pages 42–56. World Scientific, 2000.

Peer-reviewed journal articles (h-index: 17)

- K. Peterson, P. Bochev, and D. Ridzal. Optimization-based, property-preserving algorithm for passive tracer transport. *Computers & Mathematics with Applications*, 159:267–286, 2024.
- H. Antil, D. P. Kouri, D. Ridzal, D. B. Robinson, and M. Salloum. Uniform flow in axisymmetric devices through permeability optimization. *Optimization and Engineering*, 25(2):669–697, 2024.
- H. Antil, D. P. Kouri, and D. Ridzal. ALESQP: An augmented Lagrangian equality-constrained SQP method for optimization with general constraints. *SIAM Journal on Optimization*, 33(1):237–266, 2023.
- S. Hardesty, H. Antil, D. P. Kouri, and D. Ridzal. The strip method for shape derivatives. *International Journal for Numerical Methods in Engineering*, 123(7):1606–1626, 2022.
- P. Bochev, D. Ridzal, M. D'Elia, M. Perego, and K. J. Peterson. Optimization-based, property-preserving finite element methods for scalar advection equations and their connection to algebraic flux correction. *Computer Methods in Applied Mechanics and Engineering*, 367:112982, 2020.

- P. Bochev and D. Ridzal. Optimization-based additive decomposition of weakly coercive problems with applications. *Computers & Mathematics with Applications*, 71(11):2140–2154, 2016.
- M. D'Elia, D. Ridzal, K. J. Peterson, P. Bochev, and M. Shashkov. Optimization-based mesh correction with volume and convexity constraints. *Journal of Computational Physics*, 313:455–477, 2016.
- P. Bochev, D. Ridzal, and K. J. Peterson. Optimization-based remap and transport: A divide and conquer strategy for feature-preserving discretizations. *Journal of Computational Physics*, 257:1113–1139, 2014.
- M. Heinkenschloss and D. Ridzal. A matrix-free trust-region SQP method for equality constrained optimization. *SIAM Journal on Optimization*, 24(3):1507–1541, 2014.
- D. P. Kouri, M. Heinkenschloss, D. Ridzal, and B. G. van Bloemen Waanders. Inexact objective function evaluations in a trust-region algorithm for PDE-constrained optimization under uncertainty. *SIAM Journal on Scientific Computing*, 36(6):A3011–A3029, 2014.
- P. Bochev, D. Ridzal, and M. Shashkov. Fast optimization-based conservative remap of scalar fields through aggregate mass transfer. *Journal of Computational Physics*, 246:37–57, 2013.
- D. P. Kouri, M. Heinkenschloss, D. Ridzal, and B. G. van Bloemen Waanders. A trust-region algorithm with adaptive stochastic collocation for PDE optimization under uncertainty. *SIAM Journal on Scientific Computing*, 35(4):A1847–A1879, 2013.
- J. Young and D. Ridzal. An application of random projection to parameter estimation in partial differential equations. *SIAM Journal on Scientific Computing*, 34(4):A2344–A2365, 2012.
- P. Bochev, H. C. Edwards, R. C. Kirby, K. J. Peterson, and D. Ridzal. Solving PDEs with Intrepid. *Scientific Programming*, 20(2):151–180, 2012.
- P. Bochev, D. Ridzal, G. Scovazzi, and M. Shashkov. Formulation, analysis and numerical study of an optimization-based conservative interpolation (remap) of scalar fields for arbitrary Lagrangian–Eulerian methods. *Journal of Computational Physics*, 230(13):5199–5225, 2011.
- P. Bochev and D. Ridzal. Rehabilitation of the lowest-order Raviart–Thomas element on quadrilateral grids. *SIAM Journal on Numerical Analysis*, 47(1):487–507, 2009.
- P. Bochev and D. Ridzal. An optimization-based approach for the design of PDE solution algorithms. *SIAM Journal on Numerical Analysis*, 47(5):3938–3955, 2009.
- R. A. Bartlett, M. Heinkenschloss, D. Ridzal, and B. G. van Bloemen Waanders. Domain decomposition methods for advection dominated linear-quadratic elliptic optimal control problems. *Computer Methods in Applied Mechanics and Engineering*, 195(44-47):6428–6447, 2006.
- P. Bleher and D. Ridzal. SU(1, 1) random polynomials. *Journal of Statistical Physics*, 106:147–171, 2002.

Peer-reviewed proceedings articles and editorials

- D. Ridzal and P. Bochev. Optimization-based property-preserving solution recovery for fault-tolerant scalar transport. In *6th European Conference on Computational Mechanics (Solids, Structures and Coupled Problems) (ECCM 6)*, pages 2571–2580. CIMNE, 2018.
- T. A. Takhtaganov, D. P. Kouri, and D. Ridzal. An importance sampling approach to risk estimation. In *Center for Computing Research Summer Proceedings 2016*, pages 77–96. Sandia National Labs, 2016.
- P. Bochev, S. A. Moe, K. J. Peterson, and D. Ridzal. A conservative, optimization-based semi-Lagrangian spectral element method for passive tracer transport. In *COUPLED VI: Proceedings of the VI International Conference on Computational Methods for Coupled Problems in Science and Engineering*, pages 23–34. CIMNE, 2015.

- M. Hajghassem, E. C. Cyr, and D. Ridzal. A time-parallel method for the solution of PDE-constrained optimization problems. In *Center for Computing Research Summer Proceedings 2015*. Sandia National Labs, 2015.
- S. A. Moe, P. Bochev, K. J. Peterson, and D. Ridzal. A conservative semi-Lagrangian spectral element method with optimization based limiters. In *Computer Science Research Institute Summer Proceedings 2014*, pages 54–66. Sandia National Labs, 2014.
- X. Deng, D. P. Kouri, and D. Ridzal. Risk-averse optimal Neumann control. In *Computer Science Research Institute Summer Proceedings 2014*, pages 3–14. Sandia National Labs, 2014.
- T. A. Takhtaganov, D. P. Kouri, D. Ridzal, and E. Keiter. Optimization under uncertainty for the Shockley and the drift-diffusion models of a diode. In *Computer Science Research Institute Summer Proceedings 2014*, pages 165–174. Sandia National Labs, 2014.
- K. J. Peterson, P. Bochev, and D. Ridzal. Optimization-based conservative transport on the cubed-sphere grid. In *Large-Scale Scientific Computing: 9th International Conference, LSSC 2013, Sozopol, Bulgaria*, pages 205–212. Springer Berlin Heidelberg, 2014.
- P. Bochev, D. Ridzal, and J. Young. Optimization-based modeling with applications to transport: Part 1, abstract formulation. In *Large-Scale Scientific Computing: 8th International Conference, LSSC 2011, Sozopol, Bulgaria*, volume 7116 of *Lecture Notes in Computer Science*, pages 63–71. Springer Berlin Heidelberg, 2012.
- J. Young, D. Ridzal, and P. Bochev. Optimization-based modeling with applications to transport: Part 2, the optimization algorithm. In *Large-Scale Scientific Computing: 8th International Conference, LSSC 2011, Sozopol, Bulgaria*, volume 7116 of *Lecture Notes in Computer Science*, pages 72–80. Springer Berlin Heidelberg, 2012.
- D. Ridzal, J. Young, P. Bochev, and K. J. Peterson. Optimization-based modeling with applications to transport: Part 3, computational studies. In *Large-Scale Scientific Computing: 8th International Conference, LSSC 2011, Sozopol, Bulgaria*, volume 7116 of *Lecture Notes in Computer Science*, pages 81–88. Springer Berlin Heidelberg, 2012.
- N. Roberts, D. Ridzal, P. Bochev, L. Demkowicz, K. J. Peterson, and C. Siefert. Application of a discontinuous Petrov-Galerkin method to the Stokes equations. In *Computer Science Research Institute Summer Proceedings 2010*, pages 32–46. Sandia National Labs, 2010.
- P. Bochev and D. Ridzal. Additive operator decomposition and optimization–based reconnection with applications. In *Large-Scale Scientific Computing: 7th International Conference, LSSC 2009, Sozopol, Bulgaria*, volume 5910 of *Lecture Notes in Computer Science*, pages 645–652. Springer Berlin Heidelberg, 2009.
- M. Heinkenschloss and D. Ridzal. An inexact trust-region SQP method with applications to PDE-constrained optimization. In *Numerical Mathematics and Advanced Applications: Proceedings of ENUMATH 2007, the 7th European Conference on Numerical Mathematics and Advanced Applications, Graz, Austria, September 2007*, pages 613–620. Springer Berlin Heidelberg, 2008.
- M. Keegan, D. Ridzal, and P. Bochev. Sparse-grid integration in finite element spaces. In *Computer Science Research Institute Summer Proceedings 2008*, pages 32–43. Sandia National Labs, 2008.
- D. Ridzal and S. S. Collis, editors. *Computer Science Research Institute Summer Proceedings 2008*. Sandia National Labs, 2008.
- M. Heinkenschloss and D. Ridzal. Integration of sequential quadratic programming and domain decomposition methods for nonlinear optimal control problems. In *Domain decomposition methods in science and engineering XVII*, pages 69–80. Springer Berlin Heidelberg, 2008.
- P. Bochev and D. Ridzal. Finite element solution of optimal control problems arising in semiconductor modeling. In *Large-Scale Scientific Computing: 6th International Conference, LSSC 2007, Sozopol, Bulgaria*, volume 4818 of *Lecture Notes in Computer Science*, pages 235–242. Springer Berlin Heidelberg, 2007.

Technical reports

- K. DiPietro, D. Morales, and D. Ridzal. Adaptive space-time methods for large scale optimal design. Technical Report SAND2022-13849, Sandia National Labs, 2022.
- M. L. Bynum, E. C. Cyr, J. H. Jalving, D. P. Kouri, B. L. Nicholson, D. Ridzal, J. D. Siirola, G. J. von Winckel, C. D. Laird, R. Parker, H. Antil, J. S. Rodriguez, N. J. Kroeger, M. Heinkenschloss, and S. Lin. Distributed in time techniques for optimization at extreme scales. Technical Report SAND2021-13445, Sandia National Labs, 2021.
- S. Hardesty, D. P. Kouri, P. Lindsay, D. Ridzal, B. L. Stevens, and R. Viertel. Shape Optimization for Control and Isolation of Structural Vibrations in Aerospace and Defense Applications. Technical Report SAND2020-9978, Sandia National Labs, 2020.
- E. C. Cyr, G. J. von Winckel, D. P. Kouri, T. A. Gardiner, D. Ridzal, J. N. Shadid, and S. Miller. LDRD Report: Topological Design Optimization of Convolutes in Next Generation Pulsed Power Devices. Technical Report SAND2017-13410, Sandia National Labs, 2017.
- P. Bochev, P. A. Kuberry, K. J. Peterson, D. Ridzal, A. C. Robinson, and M. K. Wong. Coupled Computational Models: From Art to Science. A Final LDRD Report. Technical Report SAND2016-11336, Sandia National Labs, 2016.
- T. Walsh, W. Aquino, D. Ridzal, and D. P. Kouri. Inversion for Eigenvalues and Modes Using Sierra-SD and ROL. Technical Report SAND2015-11101, Sandia National Labs, 2015.
- T. Walsh, W. Aquino, D. Ridzal, D. P. Kouri, B. G. van Bloemen Waanders, and A. Urbina. Viscoelastic material inversion using Sierra-SD and ROL. Technical Report SAND2014-19498, Sandia National Labs, 2014.
- M. A. Aguiló and D. Ridzal. Optimality conditions for the numerical solution of optimization problems with PDE constraints. Technical Report SAND2014-2464, Sandia National Labs, 2014.
- J. R. Kamm, E. Love, A. C. Robinson, J. Young, and D. Ridzal. Edge remap for solids. Technical Report SAND2013-10281, Sandia National Labs, 2013.
- D. Ridzal, M. Aguiló, and J. Young. Preconditioning of a Full-Space Trust-Region SQP Algorithm for PDE-constrained Optimization. Technical Report 04/2013, Mathematisches Forschungsinstitut Oberwolfach, 2013. In *Numerical Methods for PDE Constrained Optimization with Uncertain Data*.
- D. Kouri, M. Heinkenschloss, D. Ridzal, and B. van Bloemen Waanders. An Approach for the Adaptive Solution of Optimization Problems Governed by Partial Differential Equations with Uncertain Coefficients. Technical Report 04/2013, Mathematisches Forschungsinstitut Oberwolfach, 2013. In *Numerical Methods for PDE Constrained Optimization with Uncertain Data*.
- J. Young and D. Ridzal. Designing experiments through compressed sensing. Technical Report SAND2013-4766, Sandia National Labs, 2013.
- N. D. Roberts, P. Bochev, L. D. Demkowicz, and D. Ridzal. A toolbox for a class of discontinuous Petrov-Galerkin methods using Trilinos. Technical Report SAND2011-6678, Sandia National Labs, 2011.
- M. Heinkenschloss, D. Ridzal, and M. A. Aguiló. Numerical study of a matrix-free trust-region SQP method for equality constrained optimization. Technical Report SAND2011-9346, Sandia National Labs, 2011.
- D. Ridzal and P. Bochev. Robust Solution Methods via Optimal Control Reformulation. Technical Report 04/2009, Mathematisches Forschungsinstitut Oberwolfach, 2009. In *Numerical Techniques for Optimization Problems with PDE Constraints*.
- R. Bartlett, S. Collis, T. Coffey, D. Day, M. Heroux, R. Hoekstra, R. Hooper, R. Pawlowski, E. Phipps, D. Ridzal, A. Salinger, H. Thornquist, and J. Willenbring. ASC Vertical Integration Milestone. Technical Report SAND2007-5839, Sandia National Labs, 2007.

PRESENTATIONS

- **Invited Lecture**, FEM@LLNL Seminar, Lawrence Livermore National Lab, October 2024.
- International Conference on Numerical Methods for Multi-Material Fluid Flows (MULTIMAT 2024), Breckenridge, CO, August 2024: *Scalable optimal control for inequality-constrained discretizations of conservation laws*.
- 16th World Congress on Computational Mechanics (WCCM), Vancouver, BC, Canada, July 2024: *Multigrid-in-time methods for nonlinear optimization of dynamical systems*.
- **Invited Lecture**, Department of Mathematics Colloquium, Southern Methodist University, Dallas, TX, April 2024.
- SIAM Conference on Optimization (OP23), Seattle, WA, June 2023: *Optimal control and optimal design of electromagnetic devices*.
- 17th U.S. National Congress on Computational Mechanics, Albuquerque, NM, July 2023: *Toward scalable optimization methods for property-preserving finite element discretizations of transport problems*.
- Trilinos User-Developer Meeting, Albuquerque, NM, October 2022: *Extreme-scale Electromagnetics for Design and Control of Metamaterials*.
- 7th International Conference on Continuous Optimization (ICCOPT), Bethlehem, PA, July 2022: *Uniform flow in axisymmetric devices through permeability optimization*.
- Virtual mini-symposium on Regularization and Augmented Lagrangian Techniques for Large-scale Optimization, Universität der Bundeswehr München, June 2022 (**by invitation only**): *An Augmented Lagrangian Equality-constrained SQP (ALESQP) Method for Optimization in Function Space*.
- **Invited Lecture**, SIAM Chapter of University of Utah, Salt Lake City, UT, April 2022.
- **Invited Lecture**, Sayas Numerics Seminar, Hosted by University of Maryland College Park, University of Maryland Baltimore County, George Mason University and University of Delaware, November 2020.
- SIAM Conference on Parallel Processing (PP20), Seattle, WA, February 2020: *Multigrid-in-Time SQP Methods for PDE-Constrained Optimization*.
- 3rd Annual Meeting of the SIAM TX/LA Section, College Station, TX, October 2020 (virtual): *An Augmented Lagrangian Equality-constrained SQP (ALESQP) Method for Function-space Optimization with General Constraints*.
- IEEE MTT-S International Conference on Numerical Electromagnetic and Multiphysics Modeling and Optimization (NEMO2019), Boston, MA, May 2019: *Adjoint-based Parallel-in-time Optimization for Electromagnetics: From Source Inversion to Design*.
- SIAM Conference on Computational Science and Engineering (CSE19), Spokane, WA, February 2019: *Scalable Optimization of Discrete-Time PDE Systems with Inequality Constraints*.
- 6th International Conference on Continuous Optimization (ICCOPT), Berlin, Germany, August 2019: *A multigrid-in-time augmented-Lagrangian method for constrained dynamic optimization*.
- 23rd International Symposium on Mathematical Programming (ISMP2018), Bordeaux, France, July 2018: *Multigrid-in-time methods for optimization with nonlinear PDE/DAE constraints*.
- SIAM Conference on Uncertainty Quantification (UQ18), Garden Grove, CA, April 2018: *Scalable Algorithms and Software for PDE-Constrained Optimization Under Uncertainty*.
- Trilinos User-Developer Meeting, Albuquerque, NM, October 2017: *Rapid Optimization Library (ROL)*.

- International Conference on Numerical Methods for Multi-Material Fluid Flows (MULTIMAT 2017), Santa Fe, NM, September 2017: *Property preserving finite element methods via constrained optimization*.
- SIAM Conference on Computational Science and Engineering (CSE17), Atlanta, GA, March 2017: *Inexact parallel-in-time solvers and SQP methods for PDE-constrained optimization*.
- **Invited Lecture**, Department of Mathematics and Statistics, University of New Mexico, February 2016.
- SIAM Conference on Uncertainty Quantification (UQ16), Lausanne, Switzerland, April 2016: *A Full-Space Approach to Stochastic Optimization with Simulation Constraints*.
- 13th U.S. National Congress on Computational Mechanics (USNCCM13), San Diego, CA, July 2015: *Inexact full-space methods for simulation-based inverse problems and large-scale optimization*.
- **Invited Lecture**, Applied and Computational Mathematics Seminar, Department of Mathematical Sciences, George Mason University, April 2015.
- **Invited Lecture**, Numerical Analysis Seminar, Department of Mathematics, University of Maryland, April 2015.
- SIAM Conference on Computational Science and Engineering (CSE15), Salt Lake City, UT, March 2015: *Integration of Approximate Schur Preconditioners and SQP Algorithms for Nonlinear PDE Optimization under Uncertainty*.
- Workshop on Modeling and Simulation of Transport Phenomena, Treis-Karden, Germany, July 2014: *Optimization-based models and algorithms for feature-preserving finite element transport*.
- Computing and Information Science (CIS) External Review, Sandia National Labs, Albuquerque, NM, May 2013: *Scalable Algorithms for Large-Scale Inversion and Design*.
- **Keynote Lecture**, 5th Conference on Computational Methods for Coupled Problems, Ibiza, Spain, June 2013: *Solving massive-scale inverse problems using matrix-free sequential quadratic programming (SQP) methods*.
- 9th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, June 2013: *Fast algorithms for optimization-based remap and transport with feature preservation*.
- Workshop on Numerical Methods for PDE Constrained Optimization with Uncertain Data, Mathematical Research Institute, Oberwolfach, Germany, January 2013 (**by invitation only**): *Preconditioning of a Full-Space Trust-Region SQP Algorithm for PDE-constrained Optimization*.
- 21st International Symposium on Mathematical Programming (ISMP 2012), Berlin, Germany, August 2012: *A matrix-free trust-region SQP algorithm for large-scale optimization*.
- Workshop on Modeling and Simulation of Transport Phenomena, Treis-Karden, Germany, July 2012: *Optimization-Based Remap and Transport: A Divide and Conquer Strategy for Feature-Preserving Discretizations*.
- **Invited Lecture**, Argonne National Lab, Lemont, IL, April 2012.
- 12th Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, March 2012: *Preconditioning of Matrix-Free Full-Space Trust-Region SQP Algorithms for Nonlinear PDE Optimization*.
- 8th International Conference on Large Scale Scientific Computations, Sozopol, Bulgaria, June 2011: *Optimization-based modeling with applications to transport: The optimization algorithm*.
- SIAM Conference on Optimization (OP11), Darmstadt, Germany, May 2011: *Integration of Data Reduction Techniques and Optimization Algorithms*.
- SIAM Conference on Computational Science and Engineering (CSE11), Reno, NV, March 2011: *Optimization Based Remap*.

- 11th Copper Mountain Conference on Iterative Methods, Copper Mountain, CO, April 2010: *A Robust Matrix-Free SQP Method for Large-Scale Optimization*.
- NNSA BER Meeting on Transport Equations in Atmospheric Modeling, Sandia National Labs, NM, March 2010: *Optimization-Based Constrained Modeling: A New Transport Paradigm*.
- **Invited Lecture**, 9th Annual Red Raider Mini-Symposium, Department of Mathematics and Statistics, Texas Tech University, Lubbock, TX, October 2009.
- **Invited Lecture**, Numerical Analysis Seminar, Los Alamos National Laboratory, Los Alamos, NM, August 2009.
- 7th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, June 2009: *Additive Operator Decomposition and Optimization-Based Reconnection with Applications*.
- Workshop on Numerical Techniques for Optimization Problems with PDE Constraints, Mathematical Research Institute, Oberwolfach, Germany, January 2009 (**by invitation only**): *Robust Solution Methods via Optimal Control Reformulation*.
- **Invited Lecture**, Special Session on Scientific Computing and Advanced Computation, Joint Mathematics Meeting (AMS/MAA/SIAM), Washington, DC, January 2009.
- **Invited Lecture**, Applied Math Colloquium, Department of Mathematics, University of Utah, Salt Lake City, UT, November 2008.
- 5th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2008), Venice, Italy, July 2008: *Scalable Solution Methods for Advection-Dominated PDEs Using an Optimal Control Reformulation*.
- John von Neumann Fellowship Lecture, Sandia National Labs, Albuquerque, NM, November 2007: *Analysis and Control of Numerical Uncertainty in PDE-Constrained Optimization*.
- **Invited Lecture**, Dept. of Mathematics and Statistics, Texas Tech University, Lubbock, TX, October 2007.
- 14th International Conference on Finite Elements in Flow Problems, Santa Fe, NM, March 2007: *A Comparative Study of Galerkin and Mixed Galerkin Methods in Optimal Control Problems with Applications to Semiconductor Modeling*.
- SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 2007: *Solution of Optimal Control Problems Arising in the Modeling and Design of Semiconductors*.
- SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, CA, February 2006: *Parallel Solution of Optimal Control Problems Using an Inexact SQP Algorithm*.
- SIAM Annual Meeting, New Orleans, LA, July 2005: *Use of Iterative Linear Solvers in a Lagrange-Newton SQP Algorithm for Large-Scale Nonlinear Optimization*.
- SIAM Conference on Computational Science and Engineering, Orlando, FL, February 2005: *A Sequential Quadratic Programming Framework for Large-Scale PDE-Constrained Optimization*.
- VIGRE Seminar on Simulation-Driven Optimization, CAAM Department, Rice University, Houston, TX, February 2005: *A Domain Decomposition Preconditioner for Optimal Control Problems Governed by Advection-Diffusion PDEs*.
- ExxonMobil Upstream Research Company, Houston, TX, January 2004: *A General Software Framework for Trust-Region SQP Algorithms*.

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

Society for Industrial and Applied Mathematics (SIAM)

Mathematical Optimization Society (MOS)

IEEE

PERSONAL DATA

Spoken Languages	English, German, Serbo–Croatian
Citizenship	USA