Tan Bui-Thanh

Curriculum Vitae

Contact

Department of Aerospace Engineering and Engineering Mechanics
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Room 308C
Austin, TX 78712

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Education

Ph.D in Computational Fluid Dynamics, February 2004–May 2007
Department of Aeronautics and Astronautics
Massachusetts Institute of Technology
Cambridge, MA, USA

Thesis: *Model-Constrained Optimization Methods for Reduction of Parameterized Large-Scale Systems*
Advisor: Prof. Karen E. Willcox
Major: Computation
Minor: Fluids

M.Eng. in High Performance Computation for Engineered Systems, July 2003
Nanyang Technological University, Singapore-MIT Alliance
Singapore

Thesis: *Proper Orthogonal Decomposition Extensions and their Applications in Steady Aerodynamics*
Advisor: Prof. Murali Damodaran and Prof. Karen E. Willcox

B.Eng. in Aeronautics (with honors), March 2001
Ho Chi Minh City University of Technology
Vietnam

Research Interests

- Numerical simulation for fluids and solids: Finite Volume Method, Finite Element Method, Discontinuous Galerkin Method, Boundary Element Method,
- Numerical Optimization: Nonlinear optimization, PDE-constrained

inversion/optimization,

- Reduced-Ordered modeling (model order reduction) for parametrized linear and nonlinear systems.
- Theoretical and numerical methods for blast-wave-structure interactions and mitigation strategies
- Numerical analysis
- Large-scale Bayesian Statistical Inverse Problems and Uncertainty Quantification
- Large-scale parallel computing
- Applied mathematics

Employment

08/2013–present Assistant Professor
Department of Aerospace Engineering and Engineering Mechanics
Institute for Computational Engineering and Sciences
University of Texas at Austin

10/2012–08/2013 Research Scientist
Center for Computational Geosciences and Optimization
Institute for Computational Engineering and Sciences
University of Texas at Austin
Austin, TX

09/2010–10/2012 Research Associate
Center for Computational Geosciences and Optimization
Institute for Computational Engineering and Sciences
University of Texas at Austin
Austin, TX

06/2008–09/2010 Postdoctoral Researcher
Center for Computational Geosciences and Optimization
Institute for Computational Engineering and Sciences
University of Texas at Austin
Austin, TX
Mentor: Prof. Omar Ghattas

06/2007–06/2008 Postdoctoral Associate
Department of Aeronautics and Astronautics
Massachusetts Institute of Technology
Cambridge, MA
Mentor: Prof. Raul Radovitzky

02/2004–05/2007 Research Assistant
Aerospace Computational Design Lab
Massachusetts Institute of Technology
Cambridge, MA
Advisor: Prof. Karen E. Willcox

06/2001–06/2003 Research Assistant
Singapore-MIT Alliance, Nanyang Technological University
Singapore
Advisor: Prof. Murali Damodaran and Prof. Karen E. Willcox

Teaching

- EU Regional School on UQ, Aachen, Germany, September 2015.
- Summer School on UQ, Norway, January 2015.
- Mathematical Methods in Applied Mechanics II, Spring 2015.
- Mathematical Methods in Applied Mechanics I, Fall 2014.
- Engineering Computation, Spring 2014, Fall 2015.
- Introduction to programming, Fall 2013.
- Advanced Theory of Finite Element Methods, University of Texas at Austin, Fall 2012. Guest lecturer.
- Computational and Variational Methods for Inverse problems, University of Texas at Austin, Fall 2012. Guest lecturer.

Student Theses

Master

Aaron Myers, ICES.

PhD

Aaron Myers, ICES (since 2015)
Ellen LE, ICES (since 2014)
Stephen Shannon, (since 2014)
Sriram Murali, Aerospace Engineering, (since 2014)
Shinhoo Kang, Aerospace Engineering, (since 2014)
Nick Alger, ICES (since 2013)

Publications

Submitted Papers

Wang, K., Bui-Thanh, T., and Ghattas, O., "A Randomized Maximum A Posteriori Method for Posterior Sampling of High Dimensional Nonlinear Bayesian Inverse Problems", Submitted, 2016

Le, E., Myers, A., and **Bui-Thanh**, T., “A Randomized Misfit Approach for Data Reduction in Large-Scale Inverse Problems”, *Submitted*, 2016.

Bui-Thanh, T., “Hybridized Discontinuous Galerkin Methods for Linearized Shallow Water Equations”, *Accepted*, 2016.

Journal Papers

Bui-Thanh, T., “ FEM-Based Discretization-Invariant MCMC Methods for PDE-constrained Bayesian Inverse Problems”, Inverse Problems and Imaging , 10(4), pp. 943–975, 2016.

Constantine, P., Kent, C., **Bui-Thanh**, T. “Accelerating MCMC with Active Subspaces”, SIAM Journal on Scientific Computing , 38(5), pp. A2779–A2805 , 2016.

Bui-Thanh, T., and Ghattas, O., “A Scalable MAP Solver for Bayesian Inverse Problems with Besov Priors”, *Inverse Problems and Imaging*, 9(1), pp. 27–53, 2015.

Bui-Thanh, T., “From Rankine-Hugoniot Condition to a Constructive Derivation of HDG Methods” *in Lecture Notes in Computational Science and Engineering: Spectral and High Order Methods for Partial Differential Equations ICOSAHOM 2014*, 2015.

Bui-Thanh, T., “From Godunov to A Unified Hybridized Discontinuous Galerkin Framework” *Journal of Computational Physics*, 295, pp. 114-146, 2015.

Wilcox, L., Stadler, G., **Bui-Thanh**, T., and Ghattas, O., “Discretely exact derivatives for hyperbolic PDE-constrained optimization problems discretized by the discontinuous Galerkin method” *Journal of Scientific Computing*, 63, pp. 138–162, 2015.

Bui-Thanh, T., and Girolami, M., “Solving Large-scale PDE-Constrained Bayesian Inverse Problems With Riemann Manifold Hamiltonian Monte Carlo” *Inverse Problems, special issue*, To Appear, 2014.

Bui-Thanh, T., and Ghattas, O., “A PDE-constrained Optimization Approach to the Discontinuous Petrov-Galerkin Method with a Trust Region Inexact Newton-CG Solver” *Comput. Methods Appl. Mech. Engrg.*, 278, pp. 20–40, 2014.

Bui-Thanh, T., and Ghattas, O., “An Analysis of Infinite Dimensional Bayesian Inverse Shape Acoustic Scattering and its Numerical Approximation”, *SIAM Journal on Uncertainty Quantification*, 2, pp. 203–222, 2014.

Roberts, N., **Bui-Thanh**, T., and Demkowicz, D., “The DPG Method for the Stokes Problem”, *Computers & Mathematics with Applications*, 67, pp. 966–995, 2014.

Chan, J., Heuer, N., **Bui-Thanh**, T., and Demkowicz, D., “Robust DPG method for convection-dominated diffusion problems II: a natural in flow condition”, *Computers & Mathematics with Applications*, 67, pp. 771–795, 2014.

Bui-Thanh, T., and Ghattas, O., “Analysis of the Hessian for Inverse Scattering

Problems. Part III: Inverse Medium Scattering of Electromagnetic Waves in Three Dimensions" *Inverse Problems and Imaging*, 7(4), pp. 1139–1155, 2013.

Bui-Thanh, T., Demkowicz, L., and Ghattas, O., "A Unified Discontinuous Petrov-Galerkin Method and its Analysis for Friedrichs' Systems", *SIAM J. Numer. Anal.*, 51(4), pp. 1933–1958, 2013.

Bui-Thanh, T., Ghattas, O., Martin, J., and Stadler, G., "A computational framework for infinite-dimensional Bayesian inverse problems. Part I: The linearized case", *SIAM Journal on Scientific Computing*, To appear, 2013.

Bui-Thanh, T., Burstedde, C., Ghattas, O., Martin, J., Stadler, G., and Wilcox, L., "Extreme-scale UQ for Bayesian inverse problems governed by PDEs", *Proceedings of SC12*, Gordon Bell Prize Finalist, 2012.

Bui-Thanh, T., Ghattas, O., and Higdon, D., "Adaptive Hessian-based Non-stationary Gaussian Process Response Surface Method for Probability Density Approximation with Application to Bayesian Solution of Large-scale Inverse Problems", *SIAM Journal on Scientific Computing*, 34(6), pp. A2837–A2871, 2012.

Bui-Thanh, T., and Ghattas, O., "Analysis of the Hessian for Inverse Scattering Problems. Part I: Inverse Shape Scattering of Acoustic Waves", *In 2013 Highlight Collection of Inverse Problems*, 28, 055001, 2012.

Bui-Thanh, T., and Ghattas, O., "Analysis of the Hessian for Inverse Scattering Problems. Part II: Inverse Medium Scattering of Acoustic Waves" *Inverse Problems*, 28, 055002, 2012.

Bui-Thanh, T., and Ghattas, O., "An Analysis of a Non-conforming hp-Discontinuous Galerkin Spectral Element Method for Wave Propagations", *SIAM Journal on Numerical Analysis*, 50(3), pp. 1801–1826, 2012.

Bui-Thanh, T., Demkowicz, L., and Ghattas, O., "Constructively Well-Posed Approximation Methods with Unity Inf-Sup and Continuity Constants for Partial Differential Equations", *Mathematics of Computation*, 82(284), pp. 1923–1952, 2013.

Wadley, H.N.G., Dharmasena, K.P., He, M.Y., McMeeking, R. M., Evans, A. G., **Bui-Thanh**, T., and Radovitzky, R., "", *International Journal of Impact Engineering*, 37(3), pp. 317–323, 2010.

Bui-Thanh, T., Willcox, K., and Ghattas, O., "Model Reduction for Large-Scale Systems with High-Dimensional Parametric Input Space", *SIAM Journal on Scientific Computing*, Vol. 30, No. 6, pp. 3270-3288. 2008.

Bui-Thanh, T., Willcox, K., and Ghattas, O., "Parametric Reduced-Order Models for Probabilistic Analysis of Unsteady Aerodynamic Applications", *AIAA Journal*, Vol. 46, No. 10, pp. 2520-2529, 2008.

Bui-Thanh, T., Willcox, K., and Ghattas, O., "Goal-Oriented, Model-Constrained Optimization for Reduction of Large-Scale Systems", *Journal of Computational Physics*, Vol. 224, 2007, pp.880–896.

Bui-Thanh, T., Damodaran, M. and Willcox, K., "Aerodynamic Data Reconstruction and Inverse Design using Proper Orthogonal Decomposition", *AIAA Journal*, Vol. 42, No. 8, August 2004, pp. 1505-1516.

Conference Papers

Bui-Thanh, T., Willcox, K., and Ghattas, O., "Parametric Reduced- Order Models for Probabilistic Analysis of Unsteady Aerodynamic Applications", *AIAA Paper 2007-2049, presented at the 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Honolulu, Hawaii*, April 2007.

Bui-Thanh, T., and Willcox, K., "Model reduction for large-scale CFD applications using the balanced proper orthogonal decomposition", *AIAA Paper 2005-4617, presented at the 16th AIAA Computational Fluid Dynamics Conference, Toronto, Canada*, June 2005.

Bui-Thanh , T., Damodaran , M. and Willcox , K., "Proper Orthogonal Decomposition Extensions for Parametric Applications in Transonic Aerodynamics", *AIAA Paper 2003-4213, presented at 15th Computational Fluid Dynamics Conference, Orlando, FL*, June 2003.

Awards and Honors

- Summer Faculty Fellowship (AFRL), 2016.
- Moncrief Challenging Award, 2014.
- DSO National Lab Award for the best master's thesis, Singapore, 2003.
- IHPC-SUN Award for the best student in "Introduction to Numerical Simulation", Singapore, 2002.
- Singapore-MIT Alliance Scholarship, Singapore, 2001–2003.
- Monthly scholarship for excellent student, Ho Chi Minh City University of Technology, Vietnam, 1996–2001.
- Colombo Plan scholarship for excellent student, Ho Chi Minh City University of Technology, Vietnam, 2000.
- Silver medal in Fluid Mechanics in national Olympic competition, Vietnam, 1999.
- ROtring Merit award for topscorer in the intake examination, Ho Chi Minh City University of Technology, Vietnam, 1998.
- Best student, Ho Chi Minh City National University, Vietnam, 1997.
- Best student, Ho Chi Minh City National University, Vietnam, 1996.

References

Prof. Karen Willcox

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Prof. Omar Ghattas
Institute for Computational Engineering and Sciences
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Prof. Leszek Demkowicz
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Prof. Youssef Marzouk
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Current contracts/grants

Extreme-scale Bayesian inference for uncertainty quantification of complex simulations (Co-PI, PI: George Biros)

Total Award Amount: $2,442,858 Source of Support: DOE ASCR
Period Covered: 09/01/2013 – 08/31/2016 Commitment level: 0.5 month

Active subspace methods for data-intensive inverse problems (Institutional PI)

Total Award Amount: $309,000	Source of Support: DOE ASCR
Period Covered: 01/15/2014 – 01/14/2016	Commitment level: 0.5 month

Research Experience

Reduced-order modeling and Computational fluid dynamics. Advances in computational fluid dynamics (CFD) have enabled high-fidelity three dimensional (3D) computations such as unsteady flows over complete aircrafts (forward solves) to be executed in minutes (or hours) on parallel computers. However, this is still far from practical, especially for design and optimization or statistical analysis purposes in which thousands of forward solves for different input parameters are required. This is also too computationally extensive for real-time predictions or responses to life-threatening events, e.g. evacuation plans due to contaminant flows or earthquakes, which need to be done in seconds. Reduced-order modeling makes this possible by generating surrogate models that mimic the high-fidelity forward system with desired accuracy and with a fraction of the cost.

My master degree under the high performance computation for engineered systems program of the Singapore-MIT Alliance taught me various aspects of computation that inspired my subsequent research. During this time, I extended the well-known proper orthogonal decomposition, a reduced-order modeling method, in many directions including the development of fast and accurate reduced models for a full CFD Euler model, fast solution methodology for inverse shape design problems, and rapid data reconstruction for transonic flow over airfoils. I was able to recover many difficult airfoils and complete flow fields from very limited number of observations.

Being at the Aerospace Computational Design Lab at MIT during my PhD study gave me unique opportunities to broaden my interdisciplinary research in computational sciences and engineering; particularly reduced-order modeling, uncertainty quantification, numerical optimization, and numerical methods for partial differential equations arising in fluids and solids. My PhD thesis reflected this cross disciplinary research by combining all these seemingly separate areas to develop a model-constrained optimization method for reduction of parametrized large-scale systems. My main contribution here was to use scalable optimization techniques to explore the structure of the forward model, e.g. using higher order information such as gradient and the Hessian, to efficiently construct accurate reduced models that are valid for a wide range of input parameters. This was not straightforward, but it could be done economically via adjoint approaches as shown in my thesis. On the contrary, if a CFD solver were treated as a blackbox, which was typically done, reduced models would be either inaccurate or prohibitively expensive to be constructed. To demonstrate the usefulness of the proposed approach, I developed and implemented a high order discontinuous Galerkin method for two dimensional turbo-machinery flow, and devised an optimization-based reduced-order modeling method to efficiently quantify the uncertainty in work per unit cycle due to geometric mistuning of rotor blades.

Computational geosciences and parallel computing Realizing that becoming a well-versed interdisciplinary professor would require further knowledge and experience in other fields such as computational solid mechanics, computational electromagnetics, inverse problems, probability theory, numerical analysis, and applied mathematics, I decided to gain them through my postdoctoral studies. My (second) postdoctoral, research associate, and research scientist were conducted at the Center for Computational Geosciences and Optimization (CCGO) within the Institute for Computational Engineering and Sciences (ICES), the University of Texas at Austin. The exceptional multidisciplinary research environment at ICES fulfilled my goal. In particular, I was one of the leaders in developing and implementing an hp-non-conforming discontinuous Galerkin (DG) spectral element method for hyperbolic partial differential equations, particularly three dimensional linear elasticity. Our code has been capable of simulating seismic wave propagation in the global earth from small to medium frequencies. Indeed, we have showed that our DG solver scales almost perfectly on the full Jaguar machine with 260,000 cores at Oak Ridge National Lab, the most powerful petascale system in US a few years ago.

My group have been currently developing scalable hydrostatic/non-hydrostatic dynamical cores for earth system models (ESMs). Our goal is to tackle the scalability bottleneck of dynamical cores by developing exascale-targeted hybridized discontinuous Galerkin methods and solvers for both hydrostatic and non-hydrostatic models. To fulfill the requirements of cloud/eddy-resolving ESMs, we design our mathematical methods and solvers such that they are conservative, high-order accurate, well suited for unstructured meshes, well suited for hp-adaptivity, well suited for applications with disparate temporal and spatial scales, requiring minimum storage, and well suited for fine-grain parallelism. Our *advanced applied mathematics developments* will have positive impacts on climate science. In particular, they are expected to contribute an important part in preparing the way for climate scientists to construct cloud/eddy-resolving earth system models. This will, in turn, advance the climate sciences in many aspects including: understanding of cloud convective processes, their effect on global warming, and how they should be parameterized; and understanding the effect of weather extremes, such as frequency of severe droughts and hurricanes, in environmental security and societal stability.

Fluid and structure interaction My first postdoctoral research was in the Department of Aeronautics and Astronautics at MIT. During this period of time, I theoretically and numerically investigated the interaction between air blast wave and structure. Together with other colleagues, I proposed an active mitigation strategy to limit injuries due to shock waves, generated by explosion for example, to both human and structures. This is important for both nation security and well-being. I tested this concept by implementing a fluid-structure interaction model in which a partitioned scheme is used to couple fluid governed by the Euler equation and a simple rigid structure governed by Newton's second law.

Inverse problems and uncertainty quantification (UQ) Computer modelings are often accompanied by uncertainty. The uncertainty could come from our lack of knowledge about physical phenomena, boundary conditions, initial conditions, forcings, random fluctuations, and properties of the medium, to name a few. Quantifying the impact of the uncertainty on computer predictions is crucial in estimating the variability and assessing confidence level. Deterministic approaches typically provide a single solution/prediction and are therefore incapable of accounting for and quantifying uncertainties. On the contrary, statistical techniques seek a statistical description of all possible solutions with associated degree of confidence assigned by a probability distribution. The advantage of statistical approaches, e.g. Bayesian statistics, is that they can systematically take into account all kinds of uncertainties. However, their main challenge is that they are intractable for large scale problems in high dimensional parameter spaces.

A large portion of my research work has been on developing scalable large-scale uncertainty quantification methodologies for statistical inverse problems using the Bayesian approach. I was one of the leaders in developing and implementing the parallel statistical inverse wave propagation with three orders of magnitude speedup. This allowed us to carry out the first 3D global seismic imaging with UQ task for more than a million parameters and 630 million wave forward (and adjoint) states. In fact, our work has been one of the Gordon Bell prize finalist papers in SC12, the international conference for high performance computing, networking, storage and analysis.

There are many ways to explore the posterior distribution, i.e. the solution of a Bayesian inverse problem, to estimate the mean and its uncertainty. We argue that, Markov chain Monte Carlo (MCMC) approaches seem to be one of the viable options to deal with large-scale complex problems. The problem is, however, that standard MCMC methods often require millions of samples, and hence expensive forward simulations, to converge—an intractable proposition. This is mainly due to the samples being strongly correlated with each other, consequently slowing down the mixing and hence the convergence. Recently, we have developed a Riemann Hamiltonian Monte Carlo (RHMC) for large-scale UQ. By exploiting the Hessian information, RHMC method only samples high probability regions, and the observed acceptance rate is close to one. Furthermore, we have observed that there is essentially no burn-in time, and more importantly each RHMC sample is almost uncorrelated with other. Nevertheless, constructing the full Hessian would require $2P$ PDE solves, where P is the number of parameters, and this is intractable for large P (e.g., $P = \mathcal{O}(10^6)$). Fortunately, we have proved that the Gauss-Newton Hessian is a compact operator, and hence its eigenvalues, under some condition, decay exponentially to zero. Thus, it admits low rank approximations. Indeed, we have used a randomized singular value decomposition technique to approximate 1025×1025 Hessian with only *ten* dominant eigenvectors and the result is indistinguishable with the one using the full Hessian.

We have also tackled other aspects of UQ. In order to attack the intractability of high dimensional Bayesian inversions, we exploit the Hessian to construct an efficient and accurate surrogate of the posterior to remove the likelihood participation, and hence its cost, in MCMC sampling. In a complement line of work, we have developed correct mesh-independent discretization/MCMC methods for infinite dimensional Bayesian inversion and prove their convergence. This is important because, to be meaningful, the discretized UQ results must converge as the mesh is refined. Furthermore, unlike standard MCMC methods, the performance of our discretization-invariant MCMC methods, i.e. their acceptance rate, does not deteriorates as the parameter dimension increases. Recently, we have developed a randomized maximum a posteriori (rMAP) method in which each rMAP sample requires an independent PDE-constrained optimization problem; a well-suited approach for extreme-scale computing systems. Though rMAP method constructs approximate samples of the posterior, the acceptance rate is high when Metropolized. We also develop non-conventional priors in to solve inverse problems whose solution is expected to be discontinuous. This work paves the way for more accurately imaging the earth interior in the future since the actual earth interior with various layers of rocks is not continuous.

High order finite element methods and applied mathematics One of the main components of my research is mathematics. I always justify my proposed methods and softwares whenever it is possible. My belief is that I will not reach very far if mathematics is taken lightly. In fact, this philosophy has showed its power as I have been able to establish the rigorous foundation for large-scale inversion methodology that we have developed. For the forward problem, I managed to prove the consistency, stability, and convergent of an hp-non-conforming DG spectral element method. On the other hand, the key to the success of our scalable methods for large scale inverse and UQ problems is the low rank approximation of the Hessian of the data misfit since it is typically compact. This has been long observed in the literature and I have been able to prove that the Hessian is in fact a compact operator in both Hölder and Sobolev spaces for inverse scattering of acoustic and electromagnetic waves. Finally, the nature of our Bayesian statistical problems is infinite dimensional and I have rigorously showed how to design a convergent discretization for various inverse problems.

On the other hand, I have been developing the discontinuous Petrov-Galerkin (DPG) method and its numerical analysis for PDEs. This is a class of guaranteed stable, robust, and high order accurate methods. Currently, I am working on designing a DPG method for 2D Euler and Navier-Stokes equations. In particular, I have proposed a PDE-constrained approach for the DPG method. This view opens the door to invite all the state-of-the-art PDE-constrained techniques to be part of the DPG framework, and hence enabling one to solve large-scale and difficult (nonlinear) problems efficiently. That is, the proposed method preserves all the attractive features of the DPG framework while enjoying all advances from the PDE-constrained optimization community.

Recently my group have developed an upwind hybridized discontinuous Galerkin (HDG) framework for general linear system of hyperbolic PDEs, a subset of which is the Friedrichs' systems embracing a large class of elliptic, parabolic, and hyperbolic PDEs including, but not limited to, scalar transport, Laplace, diffusion, convection-diffusion, convection-diffusion-reaction, linear(ized) continuum mechanics, time-domain acoustics, and the Maxwell's equations. The idea is first hybridizing the numerical flux and then transforming the usual global DG system into much smaller and sparser global system, and many independent little local systems. This is well-suited for current and future supercomputers with massive concurrencies. Applying the proposed HDG framework and exploiting the structure of the PDE under consideration such as convection-diffusion equations, Maxwell equations, and Stokes equation allow us to construct HDG methods with least number of trace unknowns, and hence most efficient. We also prove the existence, uniqueness, and stability, of the HDG solutions for these equations.

Technical Reviewer

Proposal Reviewer: Swiss National Supercomputing Centre since 2011

Applied Mathematical Modeling, Elsevier

AIAA Journal

SIAM Journal on Scientific Computing

International Journal for Numerical Methods in Engineering, Wiley

Computer Methods in Applied Mechanics and Engineering, Elsevier

Journal of Vibration and Acoustics, ASME

Computers and Mathematics with Applications, Elsevier

Applied Numerical Mathematics, Elsevier

Journal of Mathematical Analysis and Applications, Elsevier

Computational Geoscences, Springer

Mathematical Reviews, American Mathematical Society

Zentralblatt Mathematical Reviews

Memberships

2005–present Member, Society for Industrial and Applied Mathematics (SIAM)

2003–present Senior Member, American Institute of Aeronautics and Astronautics (AIAA)

Conference organizer

An organizer of the minisymposium on “Higher Order Finite Element Discretizations” at the 1st Pan-American Congress on Computational Mechanics, Buenos Aires, 2015.

An organizer of the minisymposium on “Recent Advances in High Order Finite Element Methods for Atmospheric Sciences” at the SIAM Conference on Computational Science and Engineering, Utah, 2015.

An organizer of the minisymposium on “Theory Implementation and Applications of HDG Methods” at the SIAM Conference on Computational Science and Engineering, Utah, 2015.

An organizer of the minisymposium on “Uncertainty Modeling and High Performance Stochastic Methods for Computationally Intensive Calibrations, Predictions and Optimizations” WCCM 14, Barcelona, Spain, 2014.

An organizer of the minisymposium on “Recent Advances in High Order Discontinuous Galerkin Methods” ICOSAHOM 14, Salt Lake City, Utah, 2014.

An organizer of the minisymposium on “Recent Advances in High Order Finite Element Methods” at the SIAM Conference on Computational Science and Engineering, Boston, MA, 2013.

An organizer of the minisymposium on “Large-Scale Full Waveform Inversion” at the SIAM Conference on Computational Science and Engineering, Boston, MA, 2013.

An organizer of the minisymposium on “Large-scale Optimization in Inverse Wave Propagation” at the SIAM Conference on Computational Science and Engineering, Reno, NV, 2011.

Invited Talks

“DG for Large-Scale Inverse Problems in Time Domain: Opportunities and Challenges”, SIAM Conference on Mathematical and Computational Issues in Geosciences, Stanford, CA, 2015.

“A hybridized discontinuous Galerkin method for earth system models’ dynamical cores”, Galerkin methods with applications in weather and climate forecasting, Scotland, 2015

“Some Recent Advances in Hybridized Discontinuous Galerkin Methods”, 1st Pan-American Congress on Computational Mechanics, Buenos Aires, 2015.

“Ensemble Methods for Large-Scale PDE-Constrained Bayesian Inverse Problems”, SIAM Conference on Computational Science and Engineering, Utah, 2015.

“Some Recent Advances in Hybridized Discontinuous Galerkin Methods”, Workshop on advanced Numerical Methods in the Mathematical Sciences, Texas A&M, 2015.

“Recent advances in solution of large-scale Bayesian inverse problems”, Finland, Applied Inverse Problem Conference, 2015.

“Towards Large-scale Computational Engineering and Sciences with Quantifiable Uncertainty”, Southern Methodist University, January, TX, 2015.

“Towards Large-scale Computational Engineering and Sciences with Quantifiable Uncertainty”, University of California at Berkerley, CA, October, 2014.

“A Randomized Map Algorithm for Large-Scale Bayesian Inverse Problems”, SIAM conference on Uncertainty Quantification, Savannah, Georgia, 2014.

“Towards Large-scale Computational Engineering and Sciences with Quantifiable Uncertainty”, Ho Chi Minh City University of Technology, August, 2014.

“Towards Large-scale Computational Engineering and Sciences with Quantifiable Uncertainty”, Vietnam Institute for Advanced Studies in Mathematics, August, 2014.

“A unified hybridized discontinuous Galerkin method”, World congress on computational Mechanics, Spain, July, 2014.

“Hybridized Discontinuous Galerkin method for non-hydrostatic atmosphere”, National Center for Atmospheric Research, Colorado, February, 2014.

“Towards Large-scale Computational Engineering and Sciences with Quantifiable Uncertainty”, University of Colorado at Boulder, Colorado, November, 2013.

“Towards Large-scale Computational Engineering and Sciences with Quantifiable Uncertainty”, National Center for Atmospheric Research, Colorado, November, 2013.

“Towards Large-scale Computational Engineering and Sciences with Quantifiable Uncertainty”, Colorado School of Mines, Colorado, November, 2013.

“Scalable approaches to large-scale statistical inverse problems”, Workshop on multiscale inverse problems, Mathematics Institute, University of Warwick, UK, June 17-19, 2013.

“Scalable approaches to large-scale statistical inverse problems”, Workshop on large-scale statistical inverse problems, Santa Fe, New Mexico, May 22-24, 2013.

“An Analysis of Infinite Dimensional Bayesian Inverse Shape Acoustic Scattering and its Numerical Approximation”, SIAM conference on Computational Sciences and Engineering, Boston, Massachusetts, Feb 25–March 1, 2013.

“Large-scale seismic inversion: Elastic-acoustic coupling, DG discretization, and uncertainty quantification”, SIAM conference on Uncertainty Quantification, Raleigh, North Carolina, April 2-5, 2012.

“A Scalable Method for Large-Scale Statistical Inverse Problems with Uncertain Data”, Conference on Data Analysis (CoDA), Santa Fe, New Mexico, February 29–March 2, 2012

“Large-scale seismic inversion: Elastic-acoustic coupling, DG discretization, gradient consistency, adaptivity, uncertainty quantification, and parallel algorithms”, Aerospace Computational Design Lab, Massachusetts Institute of Technology, 2011.

“Seismic Inversion Using Discontinuous Galerkin Methods”, SIAM Conference on Mathematical and Computational Issues in Geosciences, Long Beach, CA, 2011.

“A Scalable Algorithm for Solutions of Large-scale Statistical Inversions”, SIAM Conference on Computational Science and Engineering, Reno, NV, 2011.

“Large-Scale Bayesian Inversion for Inverse Wave Scattering”, Informs 2010, Austin, TX, 2010.

“Scalable Methods for Bayesian Statistical Inference”, US National Congress on Computational Mechanics 10, Columbus, Ohio, July 19, 2009.

November 4, 2016