Masayuki Yano

University of Toronto Institute for Aerospace Studies
4925 Dufferin St, Toronto, M3H 5T6, Canada
E-mail: masa.yano@utoronto.ca
Web: `https://www.utias.utoronto.ca/ace/`

Education

Massachusetts Institute of Technology, Cambridge, MA
Ph.D., Aeronautics and Astronautics, June 2012, GPA 5.0/5.0
Major: Aerospace Computational Engineering
Minor: Aerospace Controls
S.M., Computation for Design and Optimization, June 2009, GPA 5.0/5.0

Georgia Institute of Technology, Atlanta, GA
B.S. Aerospace Engineering, May 2007, GPA 4.0/4.0
Minor: Mathematics

Appointments and research experience

Associate Professor, Institute for Aerospace Studies — 7/2022–present
University of Toronto

Assistant Professor, Institute for Aerospace Studies — 10/2015–6/2022
University of Toronto

Postdoctoral Associate, Mechanical Engineering — 6/2012–9/2015
Massachusetts Institute of Technology

Research Assistant, Aerospace Computational Design Lab — 9/2007-6/2012
Massachusetts Institute of Technology

Undergraduate Research Assistant, Electric Propulsion Lab — 8/2005–8/2007
Georgia Institute of Technology

Summer Fellow, Center for Space Nuclear Research — 5/2006–8/2006
Idaho National Laboratory

Undergraduate Research Assistant, Experimental Aerodynamics Group — 1/2005–5/2005
Georgia Institute of Technology

Recognitions

Connaught New Researcher Award (2020)
NSERC Discovery Accelerator Supplement (2017)
Singapore-MIT Alliance Graduate Fellowship in Computational Engineering (2011–2012)
2nd Place AIAA CFD Student Paper Competition (2011)
Outstanding Teaching Assistant: Wunsch Foundation Silent Hoist and Crane Award (2011)
MIT Aeronautics and Astronautics Department Fellowship (2007–2008)
1st Place AIAA Undergraduate Space Systems Design Competition (2007)
1st Place Georgia Tech Undergraduate Research Spring Symposium (2007)
Georgia Tech President's Undergraduate Research Award (Spring 2006, Fall 2006)

Research interests

Numerical methods, scientific computation, and numerical analysis for partial differential equations (PDEs) with applications in continuum mechanics. Current topics include *a posteriori* error estimation, mesh adaptation, model reduction of parametrized PDEs, and data assimilation.

Publications

Journal publications

J29. C. Audouze, A. Klein, A. Butscher, N. Morris, P. B. Nair, and M. Yano. "Robust level-set-based topology optimization under uncertainties using anchored ANOVA Petrov-Galerkin method." SIAM/ASA Journal on Uncertainty Quantification, 11(3): 877–905, 2023.

J28. G. Lu, A. M. Steinberg, and M. Yano. "A sparse optical flow inspired method for 3D velocimetry." Experiments in Fluids, 64:66, 2023.

J27. A. F. Ilersich, K. A. Schau, J. C. Oefelein, A. M. Steinberg, and M. Yano. "Augmenting covariance estimation for ensemble-based data assimilation in multiple-query scenarios." Combustion Theory and Modelling, 26(6): 1041–1070, 2022.

J26. G. Donoghue and M. Yano. "A multi-fidelity ensemble Kalman filter with hyperreduced reduced-order models." Computer Methods in Applied Mechanics and Engineering, 398:115282, 2022.

J25. E. Du and M. Yano. "Efficient hyperreduction of high-order discontinuous Galerkin methods: element-wise and point-wise reduced quadrature formulations." Journal of Computational Physics, 466:111399, 2022.

J24. A. Klein, P. B. Nair, and M. Yano. "*A priori* error analysis of shape derivatives of linear functionals in structural topology optimization." Computer Methods in Applied Mechanics and Engineering, 395:114991, 2022.

J23. M. Sleeman and M. Yano. "Goal-oriented model reduction for parametrized time-dependent nonlinear partial differential equations." Computer Methods in Applied Mechanics and Engineering, 388:114206, 2022.

J22. K. Kumashiro, A. M. Steinberg, and M. Yano. "A functional error analysis of differential optical flow methods." Experiments in Fluids, 62:159, 2021.

J21. M. Yano, T. Huang, and M. J. Zahr. "A globally convergent method to accelerate topology optimization using on-the-fly model reduction." Computational Methods in Applied Mechanics and Engineering, 375:113635, 2021.

J20. G. Donoghue and M. Yano. "Spatio-stochastic adaptive discontinuous Galerkin methods." Computer Methods in Applied Mechanics and Engineering, 374:113570, 2021.

J19. M. Yano. "Goal-oriented model reduction of parametrized nonlinear PDEs; application to aerodynamics." International Journal for Numerical Methods in Engineering, 121:5200–5226, 2020.

J18. M. Yano. "Discontinuous Galerkin reduced basis empirical quadrature procedure for model reduction of parametrized nonlinear conservation laws." Advances in Computational Mathematics, 45:2287–2320, 2019.

J17. M. Yano, and A. T. Patera. "An LP empirical quadrature procedure for reduced basis treatment of parametrized nonlinear PDEs." Computer Methods in Applied Mechanics and Engineering, 344:1104-1123, 2019.

J16. D. Getty, H. Li, M. Yano, C. Gao, and A. E. Hosoi. "Luck and the law: quantifying chance in fantasy sports and other contests." SIAM Review, 60:869–887, 2018.

J15. M. Yano. "A reduced basis method for coercive equations with an exact solution certificate and spatio-parameter adaptivity: energy-norm and output error bounds." SIAM Journal on Scientific Computing, 40(1):A388-A420, 2018.

J14. T. Taddei, J. D. Penn, M. Yano, and A. T. Patera. "Simulation-based classification; a model-order reduction approach for structural health monitoring." Archives of Computer Methods in Engineering, 25:1–23, 2018.

J13. A. T. Patera, and M. Yano. "An LP empirical quadrature procedure for parametrized functions." Comptes Rendus Mathematique, 355(11):1161-1167, 2017.

J12. M. Yano. "A minimum-residual mixed reduced basis method: exact residual certification and simultaneous finite-element reduced-basis refinement," Mathematical Modelling and Numerical Analysis, 50:163–185, 2016.

J11. Y. Maday, O. Mula, A. T. Patera, and M. Yano. "The generalized Empirical Interpolation Method: stability theory on Hilbert spaces with an application to the Stokes equation." Computer Methods in Applied Mechanics and Engineering, 287:310–334, 2015.

J10. M. Yano. "A reduced basis method with exact-solution certificates for steady symmetric coercive equations." Computer Methods in Applied Mechanics and Engineering, 287:290–309, 2015.

J9. Y. Maday, A. T. Patera, J. D. Penn, and M. Yano."A parametrized-background data-weak approach to variational data assimilation: formulation, analysis, and appliation to acoustics." International Journal for Numerical Methods in Engineering, 102:933–965, 2015.

J8. M. Yano. "A space-time Petrov-Galerkin certified reduced basis method: application to the Boussinesq equations." SIAM Journal on Scientific Computing, 36:A232–A266, 2014.

J7. M. Yano, A. T. Patera, and K. Urban. "A space-time hp-interpolation-based certified reduced basis method for Burgers' equation." Mathematical Models and Methods in Applied Sciences, 24:1903, 2014.

J6. M. Yano, J. D. Penn, and A. T. Patera. "A model-data weak formulation for simultaneous estimation of state and model bias." Comptes Rendus Mathematique, 351:937–941, 2013.

J5. M. Yano and A. T. Patera. "A space-time variational approach to hydrodynamic stability theory." Proceedings of the Royal Society A, 469(2155): Article Number 20130036, 2013.

J4. M. Yano and D. L. Darmofal. "An optimization framework for anisotropic simplex mesh adaptation." Journal of Computational Physics, 231:7626–7649, 2012.

J3. M. Yano and D. L. Darmofal. "BDDC preconditioning for high-order Galerkin least-squares method using inexact solvers." Computer Methods in Applied Mechanics and Engineering, 199:2958–2969, 2010.

J2. M. Yano and M. L. R. Walker. “Generalized theory of annularly-bounded helicon waves.” Physics of Plasmas, 14, 033510:1–7, 2007.

J1. M. Yano and M. L. R. Walker. “Plasma ionization by annularly-bounded helicon waves.” Physics of Plasmas, 13, 063501:1–5, 2006.

Book chapters

B2. M. Yano. “Model reduction in computational aerodynamics.” In P. Benner, S. Grivet-Talocia, A. Quarteroni, G. Rozza, W. H. A. Schilders, L. M. Silveira (eds). Handbook on Model Order Reduction, Volume 3, Chapter 6, 2020.

B1. M. Yano. “A reduced basis method with an exact solution certificate and spatio-parameter adaptivity: application to linear elasticity.” In P. Benner , M. Ohlberger, A. Patera, G. Rozza, K. Urban (eds). Model Reduction of Parametrized Systems. MS&A (Modeling, Simulation and Applications), vol 17, 2017.

Conference proceedings

C13. B. Gibson and M. Yano. “Accelerated nonlinear-PDE-constrained optimization by reduced order modeling.” European Congress on Computational Methods in Applied Sciences and Engineering, June 2022.

C12. A. F. Ilersich, K. A. Schau, J. C. Oefelein, A. M. Steinberg, and M. Yano. “Reducing the Cost of Ensemble-Based Data Assimilation in Multiple-Query Scenarios through Covariance Augmentation.” AIAA 2021-3632, AIAA Propulsion and Energy 2021 Forum, August 2021.

C11. E. Du, M. Sleeman, and M. Yano. “Adaptive discontinuous Galerkin reduced basis empirical quadrature procedure for many-query CFD problems.” AIAA 2021-2716, AIAA Aviation 2021 Forum, August 2021.

C10. K. Kumashiro, A. Steinberg, and M. Yano. “High spatial resolution 3d fluid velocimetry by tomographic particle flow velocimetry.” AIAA 2019-0269, AIAA Science and Technology Forum and Exposition 2019, January 2019.

C9. Y. Maday, A. T. Patera, J. D. Penn, and M. Yano. “PBDW state estimation: noisy observations; configuration-adaptive background spaces; physical interpretations.” ESAIM: Proceedings and Surveys, 50:144–168, 2015.

C8. D. L. Darmofal, S. R. Allmaras, M. Yano, and J. Kudo. “An adaptive, higher-order discontinuous Galerkin finite element method for aerodynamics.” AIAA 2013-2871, 21st AIAA Computational Fluid Dynamics Conference, June 2013.

C7. M. Yano and D. L. Darmofal. “Anisotropic simplex mesh adaptation by metric optimization for higher-order DG discretizations of 3D compressible flows.” 10th World Congress on Computational Mechanics, July 2012.

C6. M. Yano and D. L. Darmofal. “An optimization framework for anisotropic simplex mesh adaptation: application to aerodynamic flows.” AIAA-2012-0079, 50th AIAA Aerospace Sciences Meeting, January 2012.

C5. M. Yano, J. M. Modisette, and D. L. Darmofal. “The importance of mesh adaptation for high-order discretizations of aerodynamic flows.” AIAA-2011-3852, 20th AIAA Computational Fluid Dynamics Conference, June 2011.

C4. J. Andren, H. Gao, M. Yano, D. L. Darmofal, C. Ollivier-Gooch, and Z. J. Wang. "A comparison of higher-order methods for a set of canonical aerodynamics applications." AIAA-2011-3230, 20th AIAA Computational Fluid Dynamics Conference, June 2011.

C3. M. Yano and D. L. Darmofal. "Massively parallel solver for the high-order Galerkin least-squares method." AIAA-2009-4135, 19th AIAA Computational Fluid Dynamics Conference, June 2009.

C2. S. D. Howe, N. Barra, J. Bess, E. Colvin, P. Cummings, B. Cunningham, M. Christ, R. Johnson, R. O'Brien, J. Perkins, K. Supak, and M. Yano. "Using a nuclear rocket to support a lunar outpost: is it cost effective?" Proceedings of the Space Nuclear Conference, American Nuclear Society, June 2007.

C1. M. Yano, D. Palmer, L. Williams, and M. L. R. Walker. "Design and operation of an annular helicon plasma source." AIAA-2007-5309, 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, July 2007.

Technical reports

TR2. M. Yano and D. L. Darmofal. "ProjectX results." 1st International Workshop on High-Order CFD Methods. January 2012.

TR1. M. Yano and D. L. Darmofal. "On dual-weighted residual error estimates for p-dependent discretizations." MIT Aerospace Computational Design Laboratory Technical Report, ACDL TR-11-1, 2011.

Dissertation

D2. M. Yano. "An Optimization Framework for Adaptive Higher-Order Discretizations of Partial Differential Equations on Anisotropic Simplex Meshes." Doctoral thesis. Massachusetts Institute of Technology, Aeronautics and Astronautics. May 2012.

D1. M. Yano. "Massively Parallel Solver for the High-Order Galerkin Least-Squares Method." Masters thesis. Massachusetts Institute of Technology, Computational for Design and Optimization. May 2009.

Online lecture notes

LN5. M. Yano. "Partial Differential Equations." 2019–2022. `https://www.utias.utoronto.ca/ace/ace-courses/`

LN4. M. Yano. "Variational Methods for PDEs." 2018–2022. `https://www.utias.utoronto.ca/ace/ace-courses/`

LN3. M. Yano. "Scientific Computing." 2016–2022. `https://www.utias.utoronto.ca/ace/ace-courses/`

LN2. A. T. Patera and M. Yano. "Math, Numerics, & Programming for Mechanical Engineers . . . in Nutshell." V1.1, September 2014. `https://ocw.mit.edu/courses/mechanical-engineering/2-086-numerical-computation-for-mechanical-engineers-fall-2014/nutshells-guis/`

LN1. M. Yano, J. D. Penn, G. Konidaris, and A. T. Patera. "Math, Numerics, & Programming for Mechanical Engineers." V1.2, September, 2012. `https://ocw.mit.edu/courses/mechanical-engineering/2-086-numerical-computation-for-mechanical-engineers-fall-2012/readings/`

Presentations

Invited keynote presentations

KP5. M. Yano. "Towards reliable and automated model reduction of parametrized aerodynamics problems: error estimation and adaptivity." Conference on Accurate ROMs for Industrial Applications. Blacksburg, United States. July 2022 (invited keynote).

KP4. M. Yano. "Efficient hyperreduction of high-order discontinuous Galerkin methods." European Congress on Computational Methods in Applied Sciences and Engineering. Oslo, Norway. June 2022 (minisymposium keynote).

KP3. M. Yano. "Model reduction of parametrized aerodynamic flows: stability, error control, and empirical quadrature." World Congress on Computational Mechanics XIII. New York City, United States. July 2018 (minisymposium keynote).

KP2. M. Yano. "Model reduction of parametrized nonlinear PDEs: empirical quadrature procedure." West Coast Reduced Order Modeling Conference. Berkeley, United States. November 2017 (invited keynote).

KP1. M. Yano. "Towards automated model reduction: exact error bounds and simultaneous finite-element reduced-basis adaptive refinement." Model Reduction for Parametrized Systems. Trieste, Italy. October 2015 (invited keynote).

Invited lectures at industrial, government, and academic institutions

IP12. M. Yano. "Towards rapid and reliable solution of parametrized PDEs: model reduction with applications to aerodynamics." Aerospace and Mechanical Engineering Seminar, Univeristy of Notre Dame. Notre Dame, United States. August 2022 (invited).

IP11. M. Yano. "Towards rapid and reliable solution of parametrized PDEs: model reduction with applications to aerodynamics." Numerical Analysis and Scientific Computing Seminar, University of Waterloo. Waterloo, Canada. June 2022 (invited).

IP10. M. Yano. "Towards reliable and automated model reduction of parametrized nonlinear PDEs: error estimation, adaptivity, and applications to aerodynamics." School for Simulation and Data Science, RWTH Aachen University. Virtual. December 2021 (invited).

IP9. M. Yano. "Reliable and efficient model reduction of parametrized nonlinear PDEs: error estimation, adaptivity, and application to aerodynamics." Seminar Series on Data-Driven Physical Simulations, Lawrence Livermore National Laboratory. Virtual. October 2021 (invited).

IP8. M. Yano. "Reliable and efficient model reduction of parametrized nonlinear PDEs: error estimation, adaptivity, and application to aerodynamics." Séminaire Calcul Scientifique et Modélisation, Institut de Mathématiques de Bordeaux. Virtual. June 2021 (invited).

IP7. M. Yano. "Reliable and efficient model reduction of parametrized aerodynamics problems: error estimation and adaptivity." Algorithms for Dimension and Complexity Reduction, Institute for Computational and Experimental Research in Mathematics, Brown University (virtual format). March 2020 (invited).

IP6. M. Yano. "Introduction to model order reduction." AI for Engineering Summer School 2019, Autodesk. Toronto, Canada. August 2019 (invited).

IP5. M. Yano. "Towards reliable and automated solution of PDEs: error estimation, adaptation, and model reduction." University of Michigan Aerospace Engineering Graduate Seminar. Ann Arbor, United States. November 2017 (invited).

IP4. M. Yano. "Towards reliable and automated solution of PDEs: error estimation, adaptation, and model reduction." Lawrence Berkeley National Laboratory Applied Math Seminar. Berkeley, United States. November 2017 (invited).

IP3. M. Yano, J. D. Penn, and A. T. Patera. "Model-data weak formulation for state and model-bias estimation: foundations and reduced basis approximation." Institut für geometrie und Praktische Mathematik Seminar. Aachen, Germany. October 2013 (invited).

IP2. M. Yano, J. D. Penn, and A. T. Patera. "Model-data weak formulation for state and model-bias estimation: foundations and reduced basis approximation." MATHICSE Seminar. Lausanne, Switzerland. October 2013 (invited).

IP1. M. Yano, J. D. Penn, and A. T. Patera. "A certified reduced-basis approximation for the model-data weak formulation: rapid and reliable in-painting for partial differential equations." Laboratoire Jacques-Louis Lions Seminar. Paris, France. October 2013 (invited).

Presentations (excluding the above proceedings)

P44. B. Gibson and M. Yano. "Accelerated nonlinear-PDE-constrained optimization using on-the-fly model reduction." US National Congress on Computational Mechanics. Albuquerque, United States, July 2023.

P43. A. Klein, C. Audouze, A. Butscher, N. Morris, P. Nair, and M. Yano. "Robust level-set-based topology optimization under uncertainties using anchored ANOVA Petrov-Galerkin method." US National Congress on Computational Mechanics. Albuquerque, United States, July 2023.

P42. G. Lu and M. Yano. "Development of non-intrusive uncertainty quantification techniques for reliable flutter prediction." US National Congress on Computational Mechanics. Albuquerque, United States, July 2023.

P41. A. Razavi and M. Yano. "Adaptive nonlinear reduced-order models for transonic flows with parametrized moving shocks." US National Congress on Computational Mechanics. Albuquerque, United States, July 2023.

P40. A. Razavi and M. Yano. "Nonlinear model reduction for parametrized transonic aerodynamic flows." SIAM Conference on Computational Science and Engineering. Amsterdam, Netherlands, March 2023.

P39. M. Yano. "Model reduction of parametrized aerodynamics problems: error estimation, adaptivity, and nonlinear approximations." Numerical Analysis of Galerkin ROMs Seminar Series. Virtual, February 2023.

P38. G. Donoghue and M. Yano. "A multi-fidelity ensemble Kalman filter with hyperreduced reduced-order models." World Congress on Computational Mechanics. Yokohama, Japan (Hybrid), July 2022.

P37. A. Humphry and M. Yano. "Empirical quadrature procedure with constraint reduction for reduced order modeling of large scale problems." World Congress on Computational Mechanics. Yokohama, Japan (Hybrid), July 2022.

P36. M. Yano. "Model reduction for aerodynamics: high-dimensional problems and shape optimization." World Congress on Computational Mechanics. Yokohama, Japan (Hybrid), July 2022.

P35. G. Donoghue, M. Sleeman, and M. Yano. "A ROM-accelerated multi-level ensemble Kalman filter for data assimilation of nonlinear dynamical systems." Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology. San Diego, United States (Hybrid), September 2021.

P34. A. Klein, P. B. Nair, and M. Yano. "Sensitivity Analysis of Linear and Nonlinear Functionals in Structural Topology Optimization: Theory and Practice." US National Congress on Computational Mechanics. Virtual, July 2021.

P33. G. Donoghue and M. Yano. "An Adaptive Multi-Fidelity Ensemble Kalman Filter using Hyperreduced ROMs." US National Congress on Computational Mechanics. Virtual, July 2021.

P32. M. Yano. "Hyperreduction for discontinuous Galerkin methods: element- and point-wise reduced quadrature formulations with applications to aerodynamics." US National Congress on Computational Mechanics. Virtual, July 2021.

P31. G. Donoghue and M. Yano. "ROM-accelerated ensemble Kalman filter for nonlinear dynamical systems." SIAM Conference on Computational Science and Engineering. Virtual, February 2021.

P30. M. Sleeman and M. Yano. "Hyperreduction for parametrized time-dependent nonlinear PDEs with applications in aerodynamics." SIAM Conference on Computational Science and Engineering. Virtual, February 2021.

P29. G. Donoghue and M. Yano. "Spatio-stochastic adaptation for discontinuous Galerkin methods." SIAM Annual Meeting. Virtual, July 2020.

P28. E. Du and M. Yano. "Reliable and efficient model reduction of nonlinear PDEs with high-dimensional geometry parametrizations." SIAM Annual Meeting. Virtual, July 2020.

P27. M. Sleeman and M. Yano. "Model reduction for parameterized time-dependent nonlinear PDEs." SIAM Annual Meeting. Virtual, July 2020.

P26. M. Yano, E. Du, and M. Sleeman. "Goal-oriented hyperreduction of nonlinear PDEs using versatile empirical quadrature procedure." SIAM Annual Meeting. Virtual, July 2020.

P25. K. Kumashiro, A. Steinberg, and M. Yano. "A High-spatial-resolution three-dimensional three-component velocimetry method based on divergence-free polynomials." 72nd Annual Meeting of the APS Division of Fluid Dynamics. Seattle, United States. November 2019.

P24. M. Yano. "Goal-oriented model reduction of parametrized Reynolds-averaged Navier-Stokes lows in aerodynamics." US National Congress on Computational Mechanics. Austin, United States. July 2019.

P23. M. Yano. "Rapid and reliable solution of parametrized aerodynamics problems by model reduction." CASI Aeronautics Conference. Laval, Canada. May 2019.

P22. G. Donoghue and M. Yano. "Adaptive stochastic discontinuous Galerkin method for reliable uncertainty propagation." SIAM Conference on Computational Science and Engineering. Spokane, United States. February 2019.

P21. M. Yano. "Goal-oriented model reduction of parametrized nonlinear PDEs in aerodynamics." SIAM Conference on Computational Science and Engineering. Spokane, United States. February 2019.

P20. K. Kumashiro, A. Steinberg and M. Yano. "High-resolution particle-based 3d velocimetry using divergence-free radial basis functions." 71st Annual Meeting of the APS Division of Fluid Dynamics. Atlanta, United States. November 2018.

P19. M. Yano. "Model reduction of parametrized aerodynamic flows: discontinuous Galerkin reduced basis empirical quadrature procedure." Model Reduction of Parametrized Systems. Nantes, France. April 2018.

P18. M. Yano. "An adaptive discontinuous Galerkin reduced basis element method for CFD." US National Congress on Computational Mechanics. Montreal, Canada. July 2017.

P17. M. Yano. "An adaptive discontinuous Galerkin reduced basis element method: application to aerodynamic flows." AIAA Aviation. Denver, United States. June 2017 (invited).

P16. M. Yano. "Adaptive high-order discontinuous Galerkin method for aerodynamic flows." CASI Aeronautics Conference. Toronto, Canada. May 2017.

P15. M. Yano. "Adaptive discontinuous Galerkin reduced basis element method for CFD." SIAM Conference on Computational Science and Engineering. Atlanta, United States. March 2017.

P14. M. Yano. "Adaptive discontinuous Galerkin reduced basis element method for CFD." SIAM Annual Meeting, Boston, United States. July 2016.

P13. M. Yano. "A minimum-residual mixed reduced basis method: exact residual certification and simultaneous finite-element reduced-basis adaptive refinement." SIAM Conference on Computational Science & Engineering. Salt Lake City, United States. March 2015

P12. Y. Maday, A. T. Patera, J. D. Penn, and M. Yano. "Parametrized-background data-weak formulation for real-time data estimation." Air Force Office of Scientific Research (AFOSR) Computational Math 2014. Arlington, United States. July 2014.

P11. Y. Maday, A. T. Patera, J. D. Penn, and M. Yano. "Parametrized-background data-weak formulation for real-time data estimation." World Congress on Computational Mechanics XI. Barcelona, Spain. June 2014.

P10. M. Yano and D. L. Darmofal. "A space-time adaptive discontinuous Galerkin method for wave propagation problems." International Conference on Spectral and High-Order Methods (ICOSAHOM) 2014. Salt Lake City, United States. June 2014.

P9. Y. Maday, A. T. Patera, J. D. Penn, and M. Yano. "An extracted-domain parametrized-background data-weak formulation for variational data assimilation: real-time in-situ state estimation in complex environments." Office of Naval Research (ONR) Basic Research Challenge (BRC) Annual Meeting. Palo Alto, United States. May 2014.

P8. Y. Maday, A. T. Patera, J. D. Penn, and M. Yano. “Parametrized-background data-weak formulation for real-time/in-situ state estimation.” Workshop on Model Order Reduction and Data. Paris, France. January 2014.

P7. M. Yano and D. L. Darmofal. “Anisotropic simplex mesh adaptation by metric optimization: application to parametrized equations.” 4th International Congress on Computational Engineering and Sciences. Las Vegas, United States. May 2013.

P6. M. Yano. “Towards reliable and automated PDE technology.” Special Seminar in Aerospace Engineering and Computational Mechanics, University of Texas at Austin. Austin, United States. March 2013 (invited).

P5. M. Yano, A. T. Patera, and K. Urban. “Space-time error bounds for reduced-order approximations of parametrized Boussinesq equations,” SIAM Conference on Computational Science & Engineering. Boston, United States. February 2013.

P4. M. Yano. “A space-time Brezzi-Rappaz-Raviart formulation for model certification and uncertainty quantification: application to moderate Reynolds number flows.” Air Force Office of Scientific Research (AFOSR/MURI) Annual Review. Cambridge, United States. November 2012.

P3. M. Yano. “A Space-time certified reduced basis method for Burgers’ and Navier-Stokes equations.” Second International Workshop on Model Reduction for Parametrized Systems. Günzburg, Germany. October 2012.

P2. M. Yano. “Towards a fully-automated PDE solver: adaptivity and error control.” Special Seminar in Aeronautics and Astronautics, Stanford University. Palo Alto, United States. September 2013 (invited).

P1. M. Yano and D. L. Darmofal. “An optimization-based framework for controlling discretization error through anisotropic h-adaptation.” 16th International Conference on Finite Elements in Flow Problems. Munich, Germany. March 2011.

Professional activities

Organizer: University of Toronto Centre for Computational Science and Engineering Symposium 2023

Local organizing committee: World Congress on Computational Mechanics 2024.

Scientific committee: Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology 2021.

Minisymposium organizer: SIAM Annual Meeting 2016; SIAM Conference on Computational Science and Engineering 2017; US National Congress on Computational Mechanics 2017; US National Congress on Computational Mechanics 2019; SIAM Annual Meeting 2020; SIAM Conference on Computational Science and Engineering 2021; US National Congress on Computational Mechanics 2021; World Congress on Computational Mechanics 2022; SIAM Conference on Computational Science and Engineering 2023; US National Congress on Computational Mechanics 2023.

Reviewer: Advances in Computational Mathematics; Computer Methods in Applied Mechanics and Engineering; Computers and Fluids; International Journal for Numerical Methods in

Engineering; Journal of Computational Physics; Journal of Scientific Computing; Mathematical Modelling and Numerical Analysis; Numerische Mathematik; SIAM/ASA Journal on Uncertainty Quantification; SIAM Journal of Scientific Computing.

Teaching

Courses taught at the University of Toronto

ESC384 Partial Differential Equations
Engineering Science, University of Toronto
Terms: 2019–2022F
Description: This course introduces techniques to analyze and solve partial differential equations (PDEs). Concepts covered include Fourier series, Sturm-Liouville theory, separation of variables, fundamental solutions, Green's functions, method of characteristics, and numerical methods. Applications are in model PDEs in continuum mechanics: heat, Laplace's, wave, and transport equations.

AER336 Scientific Computing
Engineering Science, University of Toronto
Terms: 2016–2020W, 2022–2023W
Course description. This course introduces numerical methods for scientific computation which are relevant to the solution of a wide range of engineering problems. Topics addressed include interpolation, integration, linear systems, least-squares fitting, nonlinear equations and optimization, initial value problems, and partial differential equations. The assignments make extensive use of MATLAB.

AER1418 Variational Methods for PDEs
Institute for Aerospace Studies, University of Toronto
Terms: 2018–2023W
Course description. This course introduces variational formulations and associated finite element methods for partial differential equations in continuum mechanics, including both elliptic and hyperbolic equations. An equal emphasis is placed on mathematical theory and practical implementation. Theoretical topics include discussions of well-posedness, optimality, and *a priori* and *a posteriori* error estimates. Practical topics include implementation of finite elements, matrix and vector assembly, and adaptive mesh refinement.

Other teaching experience

Curriculum Developer, Mechanical Engineering, MIT/SUTD — 6/2011–10/2011
2.086 Numerical Computation for Mechanical Engineers

Teaching Assistant, Mechanical Engineering, MIT — Spring 2011
2.086 Numerical Computation for Mechanical Engineers

Teaching Assistant, Aeronautics and Astronautics, MIT — Fall 2009, Spring 2010
16.001/2/3/4 Unified Engineering (Fluid)

Undergraduate Teaching Assistant, Mathematics, Georgia Tech — Fall 2006, Spring 2007
MATH1502 Calculus II

Teaching conferences

MathWorks Research Summit, Boston, United States, June 2018
Panelist: Computational and Mathematical Thinking

MathWorks Curriculum Conference, Boston, United States, June 2016