

**Karen E. Willcox, MNZM, PhD**  
**Director, Oden Institute for Computational Engineering and Sciences**  
**Associate Vice President for Research**  
**Professor of Aerospace Engineering and Engineering Mechanics**  
**W. A. "Tex" Moncrief, Jr. Chair in Simulation-Based Engineering and Sciences**  
**Peter O'Donnell, Jr. Centennial Chair in Computing Systems**  
**The University of Texas at Austin**  
email: [kwillcox@oden.utexas.edu](mailto:kwillcox@oden.utexas.edu)      website : [kiwi.oden.utexas.edu](http://kiwi.oden.utexas.edu)

## **Education**

1994    University of Auckland, Bachelor of Engineering, First Class Honours (Engineering Science)  
1996    Massachusetts Institute of Technology, Master of Science (Aeronautics and Astronautics)  
          Thesis: *Aeroelastic Computations in the Time Domain using Unstructured Meshes*  
2000    Massachusetts Institute of Technology, PhD (Aeronautics and Astronautics)  
          Thesis: *Reduced-Order Aerodynamic Models for Aeroelastic Control of Turbomachines*

## **Experience**

### University of Texas at Austin

2020-present    Associate Vice President for Research  
2018-present    Director, Oden Institute for Computational Engineering and Sciences  
2018-present    Professor of Aerospace Engineering and Engineering Mechanics

### Santa Fe Institute

2019-present    External Professor

### Massachusetts Institute of Technology

2012-2018    Professor, Aeronautics and Astronautics  
2011-2013    Associate Department Head, Aeronautics and Astronautics  
2008-2018    Founding Co-Director, MIT Center for Computational Engineering  
2005-2012    Associate Professor, Aeronautics and Astronautics  
2001-2005    Assistant Professor, Aeronautics and Astronautics

### Singapore University of Technology and Design

2018    Visiting Professor (7-month stay)  
2015    Visiting Professor (6-month stay)  
2011    Visiting Associate Professor (6-month stay)

### University of Auckland, New Zealand

2008-2009    Visiting Associate Professor, Department of Engineering Science (15-month stay)  
2015    Visiting Professor, Department of Engineering Science (8-month stay)

### Sandia National Laboratories

2005    Visiting Researcher, Computer Science Research Institute (5-month stay)

### Stanford University

2005    Visiting Scholar (1-month stay)

### Boeing Phantom Works

2000-2001    Visiting Researcher, Blended-Wing-Body Aircraft Design Group (1-year stay)

### NASA Dryden Flight Research Center

1996    Aerospace Intern, Aerodynamics Branch

# Karen E. Willcox, MNZM, PhD

## **Professional Interests**

Research: Data to decisions in engineering systems. Computational models and methods for design, optimization, control and uncertainty quantification of engineering systems. Predictive data science and scientific machine learning. Reduced-order modeling and multi-fidelity methods. Future aircraft technologies, aircraft system optimization, aircraft environmental impact, multidisciplinary design, unmanned aerial vehicles, Digital Twin, Digital Thread.

Education: EdTech for data visualization, modeling and analytics ([mapping.mit.edu](http://mapping.mit.edu)). Fly-by-Wire intervention to enable scalable differentiated instruction in community colleges ([fbw.mit.edu](http://fbw.mit.edu)). Mapping learning outcomes across the undergraduate engineering curriculum ([xoces.mit.edu](http://xoces.mit.edu)); linking topics across the curriculum ([crosslinks.mit.edu](http://crosslinks.mit.edu)).

Teaching: Principles of Automatic Control (undergraduate), Computational Methods in Aerospace Engineering (undergraduate), Signals and Systems (undergraduate), Multidisciplinary System Design Optimization (graduate), Flight Vehicle Aerodynamics (graduate), Numerical Methods for Partial Differential Equations (graduate).

STEM Workforce Development: Led innovations in admissions and mentoring for undergraduate and graduate aerospace engineering student body as Associate Department Head at MIT. Supported and mentored multiple student groups at UT Austin. Led Rising Stars events at MIT and UT Austin – open events with a focus on increasing the participation of women in aerospace engineering and computational sciences. Active in outreach activities to promote girls' interest in science, mathematics and engineering, including volunteer grade school science extension classes, many outreach visits to K-12 schools, and participation in the Advisory Board for Girls' Angle. First-generation student mentor at MIT.

## **Professional Memberships**

Member, National Academy of Engineering (NAE)

Fellow, American Institute of Aeronautics and Astronautics (AIAA)

Fellow, Society for Industrial and Applied Mathematics (SIAM)

Fellow, U.S. Association for Computational Mechanics (USACM)

Fellow, Asia-Pacific Artificial Intelligence Associate (AAIA)

Member, American Society for Engineering Education (ASEE)

Member, American Mathematical Society (AMS)

Member, Texas Academy for Medicine, Engineering, Science and Technology (TAMEST)

## **External Boards and Committees (active)**

MD Anderson Cancer Center, Institute for Data Science in Oncology, External Advisory Board (2023 – 2026)

American Institute of Physics (AIP) Publishing, Board of Managers (2023 – present)

CIMNE – International Centre for Numerical Methods in Engineering, Spain, Scientific Advisory Council (2023 – 2027)

Department of the Air Force Scientific Advisory Board (2023 – present)

National Academies Section 1 Peer Committee (2023 – 2026)

TAMEST 2024 Annual Meeting, Co-Chair (2023 – 2024)

National Academies 2024 U.S. Frontiers of Engineering Symposium, Chair (2023 – 2024)

Harvard University, Committee to Visit Harvard University Information Technology (HUIT) (2019 – present; Chair, 2022 – present)

International Association for Computational Mechanics (IACM), Executive Council (2022 – 2028)

Claremont McKenna College, Founding Science Advisory Council (2021 – present)

Institute for Water Futures, Australian National University, Advisory Board (2021 – 2024)

AIAA Board of Trustees (2020 – 2026)

Advisory Board, Center of Excellence on Sustainable and Energy Efficient Aviation, TU Braunschweig, Germany (2020 – present)

Santa Fe Institute, Science Board (2019 – present)

## **Karen E. Willcox, MNZM, PhD**

Michigan Institute for Computational Discovery and Engineering, University of Michigan, External Advisory Board, (Member, 2017 – present)

Sandia National Laboratories, Computing and Information Sciences Research Foundation, External Review Board (Member, 2016 – present)

National Academies Board on Mathematical Sciences and Analytics (BMSA) (Co-chair, 2023 – present; member 2016 – present)

Girls' Angle, Advisory Board (2014 – present)

### **External Boards and Committees (past)**

Oak Ridge National Laboratory, Advisory Committee, Computing and Computational Sciences Directorate (2023 – 2024)

National Academies Study on Foundational Research Gaps and Future Directions for Digital Twins (Chair, 2022 – 2024)

AIAA 2023 SciTech Forum, Guiding Coalition (2022 – 2023)

MATH+ Scientific Advisory Board, Germany (2021 – 2023)

Advanced Simulation and Computing (ASC) at the Los Alamos National Laboratory, Advisory Board (2021 – 2023)

Oak Ridge National Laboratory, Search Committee, Associate Laboratory Director for the Computing and Computational Sciences Directorate (2023)

National Academies Study on Post-Exascale Computing for the National Nuclear Security Administration (2021 – 2023)

Institute for Mathematical and Statistical Innovation (IMSI), Board of Advisors (Vice-chair, 2020 – 2024)

National Science Foundation, Advisory Committee for Cyberinfrastructure (2019 – 2022, Co-chair 2020 – 2022)

SIAM 2022 Conference on Mathematics of Data Science, Co-Chair (MDS22)

AIAA 2022 SciTech Forum, Executive Steering Committee

SIAM Activity Group on Data Science (Inaugural Program Director, 2021 – 2022)

AIAA Multidisciplinary Design Optimization (MDO) Technical Committee (2001 – 2021); Chair (2019 – 2021);

Vice-Chair (2017 – 2019); Awards Subcommittee Chair (2003 – 2006); Publications Subcommittee Chair (2011 – 2018)

SIAM Journals Committee (2019 – 2021)

National Academies Planning Committee on the Workshop on the Frontiers of Mechanistic Data-Driven Modeling for Additive Manufacturing (2019)

AIAA Fellows Selection Committee (2019 – 2022)

SIAM Fellows Selection Committee (2018 – 2020)

Department of Energy Working Group on Basic Research Needs for Scientific Machine Learning (2017 – 2019)

National Academies Committee to Assess the Risks of Unmanned Aircraft Systems (UAS) Integration (2017 – 2018)

SIAM Committee on Science Policy (2016 – 2018)

SIAM Activity Group on Computational Science and Engineering: Vice President (2013 – 2015), Program Director (2011 – 2013)

SIAM 2013 Conference on Computational Science and Engineering, Co-Chair

Institute-wide Task Force on the Future of MIT Education, Co-Chair (2013 – 2014)

MIT OpenCourseWare Faculty Advisory Committee (2011 – 2018; Chair 2015 – 2018)

AIAA MDO Conference Technical Chair (2011 – 2012)

Department of Engineering Science, University of Auckland, Advisory Board (Member, 2008 – 2018)

National Research Council, Committee to Conduct an Independent Assessment of the Nation's Wake Turbulence Research and Development Program (2007)

National Academies Decadal Survey of Civil Aeronautics, Aerodynamics and Acoustics Panel (2005 – 2006)

**Visiting Committees and Review Boards (past)**

ExxonMobil Corporate Strategic Research, Capability Assessment External Review Panel (Physics and Mathematical Science and Scientific Computing) (2021)

Delft University of Technology, Netherlands, Review Committee, Research Assessment of Aerospace Engineering (2020 – 2022)

National Academies Panel on Review of the Information Technology Laboratory (ITL) at the National Institute of Standards and Technology (NIST) (2018)

TU Braunschweig Universities of Excellence, German Excellence Initiative, Review Committee (2018)

Colorado School of Mines, Applied Mathematics & Statistics Department Visiting Committee (Member, 2017)

HarvardX Review Committee, Harvard University (Member, 2016)

Institute for Computational Engineering and Sciences, University of Texas at Austin, Board of Visitors (2012 – 2018; Chair 2015 – 2018)

Delft University of Technology, Netherlands, Assessment Committee, Accreditation of Aerospace Engineering (2013)

National Science Foundation, Division of Mathematical Sciences, Committee of Visitors (Member, 2010)

**Editorial Boards**

*Computer Methods in Applied Mechanics and Engineering* (Editorial Board Member, 2022 – present)

*International Journal of Computational Methods in Engineering Science and Mechanics* (Advisory Board Member, 2022 – present)

*Acta Numerica* (Editorial Board Member, 2021 – present)

*IEEE Computing in Science and Engineering (CiSE)* (Associate Editor, 2021 – 2024)

*AIAA Journal* (Editorial Board Member, 2021 – present; Associate Editor, 2015 – 2020 and 2009 – 2011)

*Journal on Data Centric Engineering* (Advisory Board, 2019 – present)

*SIAM Journal on Scientific Computing* (Section Editor, 2013 – 2019; Associate Editor, 2008 – 2013)

*ASA/SIAM Journal on Uncertainty Quantification* (Associate Editor, 2012 – 2013)

*SIAM Book Series on Computational Science and Engineering* (Editorial Board Member, 2009 – present)

**Major Internal Committees and Leadership Roles (at MIT and UT Austin)**

UT Austin Vice President for Research Search Advisory Committee (2024)

UT Austin Provost Search Advisory Committee, Chair (2021)

Associate Vice President for Research, UT Austin (2020 – present)

Director, Oden Institute for Computational Engineering and Sciences, UT Austin (2018 – present)

MIT OpenCourseWare Faculty Advisory Committee (Chair, 2015 – 2018; Member, 2011 – 2018)

MIT Online Education Policy Initiative, Co-Chair (2015 – 2016)

Institute-wide Task Force on the Future of MIT Education, Co-Chair (2013 – 2014)

Co-Chair, Mission and Scope Subcommittee, Ad Hoc Committee on the Formation of a New Entity in the Areas of Complex and Socio-technical Systems, Information and Decision Systems, and Statistics (2013 – 2014)

Associate Department Head, MIT Department of Aeronautics and Astronautics (2011 – 2013)

Chair, Ad Hoc Committee on Statistics at MIT (2011 – 2012)

Founding Co-Director, MIT Center for Computational Engineering (2008 – 2018)

### **Public Positions and Testimonies**

Testified to Congress for the Subcommittee on Energy of the House Committee on Science, Space, and Technology hearing on Accelerating Discovery: the Future of Scientific Computing at the Department of Energy (May 2021).

### **Selected Awards and Honors**

2024 Theodore von Karman Prize for “important contributions to computational science and engineering. Professor Willcox has pioneered the development and use of model reduction methods for optimal design, optimal control, uncertainty quantification, decision-making, and digital twins. Her fundamental work has had broad impact in many application areas including inverse problems, optimal design, aerospace engineering and precision medicine.”

Paper "Data-driven physics-based digital twins via a library of component-based reduced-order models" one of the top ten most cited papers published in *International Journal for Numerical Methods in Engineering* over the two-year period 1/1/2022-12/31/2023.

Asia-Pacific Artificial Intelligence Association (AAIA) Fellow, 2024

2023 U.S. Association for Computational Mechanics J. Tinsley Oden Medal “for contributions to model reduction and multi-fidelity methods for the design and optimal control of high-dimensional systems with uncertainties.”

USACM Fellow, Class of 2023. “For outstanding achievements in developing scalable methods for design of predictive digital twins under uncertainty, reduced-order modeling, data-to-decisions in aerospace engineering, and her leadership roles in computational sciences and engineering.”

2022 Lecturer for the Leçons Jacques-Louis Lions, Sorbonne University.

Paper “Design of digital twin sensing strategies via predictive modeling and interpretable machine learning” selected as a Featured Article for *Journal of Mechanical Design*, August 2022.

Paper “A probabilistic graphical model foundation for enabling predictive digital twins at scale” selected for the *Nature Computational Science* one-year anniversary collection, January 2022.

Elected to the National Academy of Engineering “for contributions to computational engineering methods for the design and optimal control of high-dimensional systems with uncertainties” 2022.

AIAA Structures, Structural Dynamics, and Materials (SDM) Lecture, presented at AIAA SciTech Forum, January 2022.

Best Paper Award for “Toward predictive digital twins via component-based reduced-order models and interpretable machine learning”, AIAA Multidisciplinary Design Optimization Best Paper, 2020

SIAM Student Paper Prize (E. Qian), “Multifidelity Monte Carlo estimation of variance and sensitivity indices,” 2020

Southwest Research Institute Best Student Paper Award (M. Kapteyn), “Toward predictive digital twins via component-based reduced-order models and interpretable machine learning,” AIAA Non-Deterministic Approaches Conference, Scitech Forum, 2020

Paper “Variance-based sensitivity analysis to support simulation-based design under uncertainty” one of the top 10 most accessed articles in *Journal of Mechanical Design* in 2019.

AIAA Fellow, Class of 2019. “For outstanding contributions to the development and use of computational methods for aerospace design, and to engineering education and outreach.”

SIAM Fellow, Class of 2018. “For contributions to model reduction and multifidelity methods, with applications in optimization, control, design, and uncertainty quantification of large-scale systems.”

NeurIPS paper “Contour location via entropy reduction leveraging multiple information sources” selected for Spotlight Presentation (3% of submissions), 2018.

## **Karen E. Willcox, MNZM, PhD**

Best Paper Award, “Towards a Low-Order Model for Transonic Flutter Prediction,” AIAA Theoretical Fluid Mechanics Conference, AIAA Aviation Forum, 2017

Member of the New Zealand Order of Merit (MNZM), awarded for services to aerospace engineering and education, 2017

Distinguished Alumni Award, University of Auckland, 2016

Member, Harvard Higher Education Leaders Forum, 2016 – 2019

SIAM SIGEST Award for paper “Goal-oriented inference: Approach, linear theory, and application to advection-diffusion,” 2013

Sir Peter Blake Trust Emerging Leader Award, 2010

Selected for National Academies Frontiers of Engineering Education Symposium, 2010

AIAA MDO Technical Committee Service Award, 2008 and 2013

J. T. Oden Faculty Research Fellow, University of Texas at Austin, 2006

New Zealand Management Magazine, Young Leader, 2006

MIT Junior Bose Teaching Award, 2005

MIT Department of Aeronautics and Astronautics Teaching Award, 2004

Best Paper Award, “A Framework for Aircraft Conceptual Design and Environmental Performance Studies,” AIAA Multidisciplinary Analysis and Optimization Conference, 2004

### **Leadership Activities**

Academic: Given hundreds of invited lectures in the US and internationally, including multiple plenary/keynote talks at major international conferences in engineering, mathematics, and computational sciences. Published over 150 papers in refereed archival journals. Supervised 64 graduate theses (41 M.S., 23 PhD). Multiple graduate students and postdocs hold academic positions at prestigious universities and leadership positions in industry. Secured funding and managed multi-institutional research projects from many sources including the U.S. Air Force, Boeing, Lockheed Martin, U.S. Department of Energy, Federal Aviation Administration, NASA, National Science Foundation, DARPA, and U.S. Department of Education.

Major multi-institution research grants as lead include: Co-lead PI and Co-Director, M2dt Multifaceted Mathematics Capability Center on Multifaceted Mathematics for Predictive Digital Twins (Department of Energy, \$13.5M total budget over 5 years). Co-lead PI and Co-Director, AEOLUS Multifaceted Mathematics Capability Center on Advances in Experimental Design, Optimal Control, and Learning for Uncertain Complex Systems (Department of Energy, \$10M total budget over 4 years). Lead PI, Multidisciplinary University Research Initiative (MURI) project on Managing Multiple Information Sources of Multi-physics Systems (Air Force Office of Scientific Research, \$7.2M total budget over 5 years). Lead PI, MURI project on Machine Learning for Physics-Based Systems (Air Force Office of Scientific Research, \$2M total budget over 3 years). Lead PI, RISE of the Machines: Robust, Interpretable, Scalable, Efficient Decision Support (Department of Energy, \$4.4M total budget over 3 years). Co-lead PI and Co-Director, DiaMonD Multifaceted Mathematics Capability Center on Mathematics at the Interfaces of Data, Models, and Decisions (Department of Energy, \$16.7M total budget over 5 years). Lead PI, Dynamic Data Driven Methods for Self-aware Aerospace Vehicles (Air Force Office of Scientific Research, \$2.5M total budget over 6 years). Lead PI, Towards Scalable Differentiated Instruction using Technology-Enabled Competency-Based Dynamic Scaffolding (Department of Education, \$2.9M total budget over 4 years).

Administrative: Director of the Oden Institute for Computational Engineering and Sciences at UT Austin (2018-present) and Associate Vice President for Research (2020-present). Oversees Oden Institute operations involving >450 people, 25

## Karen E. Willcox, MNZM, PhD

research groups and centers, >\$130M in active research contracts/grants, and >\$150M endowment funding. Strategic leadership for Oden Institute research priorities, educational programs, administrative functions, external partnerships, financial management, and development. Previously, served as the founding co-director of the MIT Center for Computational Engineering (2008-2018) and the Associate Head of the MIT Department of Aeronautics and Astronautics (2011-2013). In Associate Head role, led reforms in the undergraduate degree program and put in place initiatives that successfully increased undergraduate enrollment in aerospace engineering.

Professional: Active professional service and leadership through multiple conference organizing committees, conference chair positions, technical committee leadership, organizational review committees, advisory boards, and editorial positions. Professional advocacy through leadership positions in SIAM and AIAA, and membership in key National Academies, Department of Energy, and National Science Foundation committees. Testified to Congress on scientific computing (2021).

### **Publications: Edited Volumes and Books**

1. Benner, P., Cohen, A., Ohlberger, M. and Willcox, K., *Model Reduction and Approximation: Theory and Algorithms*, SIAM Computational Science and Engineering Book Series, SIAM, Philadelphia, PA, 2017.
2. Biegler, L., Biros, G., Ghattas, O., Heinkenschloss, M., Keyes, D., Mallick, B., Tenorio, L., van Bloemen Waanders, B., Willcox, K. and Marzouk, Y. *Large-scale Inverse Problems and Quantification of Uncertainty*, Wiley Series in Computational Statistics, John Wiley & Sons, 2011.

### **Publications: Refereed Journal Articles**

1. Farcas, I.-G., Gundevia, R., Munipalli, R. and Willcox, K. Domain decomposition for data-driven reduced modeling of large-scale systems. *AIAA Journal*, Published Online 25 September, 2024.
2. Pham, J., Ghattas, O., Clemens, N. and Willcox, K. Real-time aerodynamic load estimation for hypersonics via strain-based inverse maps. To appear, *AIAA Journal*, 2024.
3. Ferrari, A. and Willcox, K., Digital twins in mechanical and aerospace engineering. *Nature Computational Science*, Vol. 4, No. 3, March 2024, pp. 178-183.
4. Willcox, K. and Segundo, B., The role of computational science in digital twins. *Nature Computational Science*, Vol. 4, No. 3, March 2024, pp. 147-149.
5. Geelen, R., Balzano, L., Wright, S. and Willcox, K. Learning physics-based reduced-order models from data using nonlinear manifolds. *Chaos*, Vol. 34, No. 3, 2024
6. Khodabakhshi, P., Burkovska, O., Willcox, K. and Gunzburger, M. Multifidelity methods for uncertainty quantification of a nonlocal model for phase changes in materials. *Computers and Structures*, Vol. 297, 2024, 107328.
7. Kramer, B., Peherstorfer, B. and Willcox K. Learning nonlinear reduced models from data with Operator Inference. *Annual Review of Fluid Mechanics*, Vol. 56, pp. 521-548, January 2024.
8. Chaudhuri, A., Pash, G., Hormuth, D., Lorenzo, G., Kapteyn, M., Wu, C., Lima, E., Yankeelov, Y. and Willcox K. Predictive digital twin for optimizing patient-specific radiotherapy regimens under uncertainty in high-grade gliomas. To appear, *Frontiers in Artificial Intelligence*, 2023.
9. Torzoni, M., Tezzele, M., Mariani, S., Manzoni, A. and Willcox K. A digital twin framework for civil engineering structures. *Computer Methods in Applied Mechanics and Engineering*, Vol. 418, 2024, 116584.
10. Huang, L., Bicol, K. and Willcox, K. Modeling COVID-19 disruptions via network mapping of the Common Core Mathematics Standards. *ASEE Computers in Education Journal*, Vol. 13, No. 2, 2023. (Previously published in proceedings of the ASEE 2021 Annual Conference.)

11. Wogrin, S., Singh, A., Allaire, D., Ghattas, O., Willcox, K. From Data to Decisions: A Real-Time Measurement–Inversion–Prediction–Steering Framework for Hazardous Events and Health Monitoring. In: Darema, F., Blasch, E.P., Ravela, S., Aved, A.J. (eds) *Handbook of Dynamic Data Driven Applications Systems*. Springer, Cham, 2023.
12. Croci, S., Wright, S. and Willcox, K. Multi-output multilevel best linear unbiased estimators via semidefinite programming. *Computer Methods in Applied Mechanics and Engineering*, Vol. 413, August 2023, 1167130.
13. McQuarrie, S., Khodabakhshi, P. and Willcox, K. Non-intrusive reduced-order models for parametric partial differential equations via data-driven operator inference. *SIAM Journal on Scientific Computing*. Vol. 45, No. 4, 2023, pp. A1917-A1946.
14. Geelen, R., Wright, S. and Willcox, K. Operator inference for non-intrusive model reduction with quadratic manifolds. *Computer Methods in Applied Mechanics and Engineering*, Vol. 403, Part B, January 2023, 115717.
15. O'Leary-Roseberry, T., Du X., Chaudhuri, A., Martins, J., Willcox, K. and Ghattas, O. *Learning high-dimensional parametric maps via reduced basis adaptive residual networks*. *Computer Methods in Applied Mechanics and Engineering*, Vol. 402, December 2022, 115730.
16. Karandikar, J., Chaudhuri, A., Smith, S., Schmitz, T. and Willcox, K. Process window estimation in manufacturing through Entropy-Sigma active learning. *Manufacturing Letters*, Vol. 34, pp. 87-92, 2022.
17. McBane, S., Choi, Y. and Willcox, K. Stress-constrained topology optimization of lattice-like structures using component-wise reduced order models. *Computer Methods in Applied Mechanics and Engineering*, Vol. 400, October 2022, 115525.
18. Guo, M., McQuarrie, S. and Willcox, K. Bayesian operator inference for data-driven reduced-order modeling. *Computer Methods in Applied Mechanics and Engineering*, Volume 402, December 2022, 115336.
19. Kapteyn, M. and Willcox, K., Design of digital twin sensing strategies via predictive modeling and interpretable machine learning. *Journal of Mechanical Design*, Vol. 144, No. 9, 2022, 091710. <https://doi.org/10.1115/1.4054907> (Selected as a Featured Article for *Journal of Mechanical Design*, August 2022.)
20. Cohen, B., March, A., Willcox, K. and Miller, D., A level set-based topology optimization approach for thermally radiating structures. *Structural and Multidisciplinary Optimization*, Vol. 65, No. 167, 2022.
21. Qian, E., Farcas, I., and Willcox, K., Reduced operator inference for nonlinear partial differential equations. *SIAM Journal on Scientific Computing*, Vol. 44, Issue 4, pp. A1934-A1959, 2022. <https://doi.org/10.1137/21M1393972>
22. Buchsbaum, Jeffrey C., et al. "Predictive Radiation Oncology–A New NCI–DOE Scientific Space and Community." *Radiation Research*, Vol. 197, No. 4, pp. 434-445, 2022.
23. Geelen, R. and Willcox, K., Localized non-intrusive reduced-order modeling in the operator inference framework. *Philosophical Transactions of the Royal Society A*, Vol. 380, Issue 2229, 20210206, 2022. <https://doi.org/10.1098/rsta.2021.0206>
24. Khodabakhshi, P. and Willcox, K. Non-intrusive data-driven model reduction for differential algebraic equations derived from lifting transformations. *Computer Methods in Applied Mechanics and Engineering*. Volume 389, 1 February 2022, 114296.
25. Ghattas, O. and Willcox, K., Learning physics-based models from data: Perspectives from inverse problems and model reduction. *Acta Numerica*, Vol. 30, pp. 445-554, 2021.
26. Chaudhuri, A., Kramer, B., Norton, M., Royset, J., and Willcox, K., Certifiable Risk-Based Engineering Design Optimization. *AIAA Journal*, Vol. 60, No. 2, pp. 551-565, February 2022.
27. Kapteyn, M., Pretorius, J. and Willcox, K., A probabilistic graphical model foundation for enabling predictive digital twins at scale. *Nature Computational Science*, Vol. 1, No. 5, May 2021, pp. 337-347. (Selected for the *Nature Computational Science* one-year anniversary collection.)
28. Niederer, S., Sacks, M., Girolami, M. and Willcox, K., Scaling digital twins from the artisanal to the industrial. *Nature Computational Science*, Vol. 1, No. 5, May 2021, pp. 313-320.
29. Khodabakhshi, P., Willcox, K., and Gunzburger, M. A multifidelity method for a nonlocal diffusion model. *Applied Mathematics Letters*, Volume 121, November 2021, 107361.
30. Willcox, K., Ghattas, O., and Heimbach, P. The imperative of physics-based modeling and inverse theory in computational science, *Nature Computational Science*, Vol. 1, No. 3, pp. 166-168, 2021.



31. Huang, L. and Willcox, K., Network models and sensor layers to design adaptive learning using educational mapping. *Design Science*, 7, E9. doi:10.1017/dsj.2021.8, 2021.
32. Ehre, M., Papaioannou, I., Willcox, K., and Straub, D., Conditional reliability analysis in high dimensions based on controlled mixture importance sampling and information reuse. *Computer Methods in Applied Mechanics and Engineering*, Volume 381, August 2021, 113826.
33. Singh, V. and Willcox, K., Decision Making Under Uncertainty for a Digital Thread Enabled Design Process. *Journal of Mechanical Design*, 143(9): 091707, September 2021.
34. McQuarrie, S., Huang, C. and Willcox, K., Data-driven reduced-order models via regularized operator inference for a single-injector combustion process. *Journal of the Royal Society of New Zealand*, Vol. 51, No. 2 pp. 194-211, 2021, DOI: 10.1080/03036758.2020.1863237.
35. Salinger S., Kapteyn M., Kays C., Pretorius J., Willcox K., A Hardware Testbed for Dynamic Data-Driven Aerospace Digital Twins. In: Darema F., Blasch E., Ravela S., Aved A. (eds) Dynamic Data Driven Application Systems. DDDAS 2020. *Lecture Notes in Computer Science*, Vol. 12312. Springer, Cham, 2020.
36. Chaudhuri, A., Marques, A., and Willcox, K., mfEGRA: Multifidelity Efficient Global Reliability Analysis through Active Learning for Failure Boundary Location. *Structural and Multidisciplinary Optimization*, Vol. 64, pp. 797–811, 2021.
37. Benner, P., Goyal, P., Kramer, B., Peherstorfer, B., and Willcox, K., Operator inference for non-intrusive model reduction of systems with non-polynomial nonlinear terms. *Computer Methods in Applied Mechanics and Engineering*, Vol. 372, pp. 113433, December 2020.
38. Kramer, B., and Willcox, K., Balanced Truncation Model Reduction for Lifted Nonlinear Systems. In Beattie, C., Benner, P., Embree, M., Gugercin, S., Lefteriu, S. (eds) *Realization and Model Reduction of Dynamical Systems*, Springer, Cham., 2021. [https://doi.org/10.1007/978-3-030-95157-3\\_9](https://doi.org/10.1007/978-3-030-95157-3_9)
39. Kapteyn, M., Knezevic, D., Huynh, D.B.P., Tran, Minh and Willcox, K., Data-driven physics-based digital twins via a library of component-based reduced-order models. *International Journal for Numerical Methods in Engineering*, 2020, <https://doi.org/10.1002/nme.6423>.
40. Qian, E., Kramer, B., Peherstorfer, B., and Willcox, K., Lift & Learn: Physics-informed machine learning for large-scale nonlinear dynamical systems. *Physica D: Nonlinear Phenomena*, Vol. 406, May 2020, 132401.
41. Swischuk, R., Kramer, B., Huang, C., and Willcox, K., Learning physics-based reduced-order models for a single-injector combustion process. *AIAA Journal*, published online March 2020. Also in Proceedings of 2020 AIAA SciTech Forum & Exhibition, Orlando FL, January, 2020. DOI 10.2514/1.J058943
42. Marques, A., Lam, R., Chaudhuri, A., Opgenoord, M. and Willcox, K., Multifidelity method for locating aeroelastic flutter boundaries. *AIAA Journal*, Vol. 58, No. 4, April 2020, pp. 1772-1784. Also in 21st AIAA Non-Deterministic Approaches Conference (AIAA Scitech), San Diego, CA, January 2019. DOI 10.2514/6.2019-0438.
43. Chaudhuri, A., Kramer, B., and Willcox, K., Information Reuse for Importance Sampling in Reliability-Based Design Optimization, *Reliability Engineering & System Safety*, Vol. 201, pp. 106853, 2020.
44. Cook, L., Willcox, K., and Jarrett, J., Design Optimization Using Multiple Dominance Relations, *International Journal for Numerical Methods in Engineering*, Vol. 121, Issue 11, pp. 2481-2502, June 2020.
45. Lam, R., Zahm, O., Marzouk, Y. and Willcox, K., Multifidelity Dimension Reduction via Active Subspaces, *SIAM Journal on Scientific Computing*, 42 (2), A929-A956, 2020.
46. Feldstein, A., Lazzara, D., Princen, N. and Willcox, K., Multifidelity Data Fusion with Application to Blended-Wing-Body Multidisciplinary Analysis Under Uncertainty, *AIAA Journal*, Vol. 58, No. 2, pp. 889-906, 2020.
47. Cook, L., Mishra, A., Jarrett, J. Willcox, K., and Iaccarino, G. Optimization under turbulence model uncertainty for aerospace design, *Physics of Fluids*, Vol. 31, Issue 10, 105111, 2019.

48. Opgenoord, M. and Willcox, K., Design Methodology for Aeroelastic Tailoring of Additively-Manufactured Lattice Structures using Low-Order Methods, *AIAA Journal*, Vol. 57, No. 11, pp. 4903-4914, 2019.
49. Kapteyn, M., Willcox, K. and Philpott, A., Distributionally Robust Optimization for Engineering Design under Uncertainty. *International Journal for Numerical Methods in Engineering*, Vol. 120, Issue 7, pp. 835-859, July 2019. (An earlier version of this work appeared in AIAA Paper 2018-0666 in Proceedings of 2018 AIAA Non-Deterministic Approaches Conference, AIAA SciTech Forum, Kissimmee, FL, January, 2018.)
50. Opgenoord, M. and Willcox, K., Design for Additive Manufacturing: Cellular Structures in Early-Stage Aerospace Design, *Structural and Multidisciplinary Optimization*, Vol. 60, Issue 2, pp 411-428, 2019.
51. Kramer, B., Marques, A., Peherstorfer, B., Villa, U. and Willcox, K., Multifidelity probability estimation via fusion of estimators, *Journal of Computational Physics*, Vol. 392, pp. 385-402, 2019.
52. Kramer, B. and Willcox, K., Nonlinear model order reduction via lifting transformations and proper orthogonal decomposition, *AIAA Journal*, Vol. 57, No. 6, pp. 2297-2307, 2019.
53. Opgenoord, M., Drela, M. and Willcox, K., Influence of Transonic Flutter on the Conceptual Design of Next-Generation Transport Aircraft, *AIAA Journal*, Vol. 57, No. 5, pp. 1973-1987, 2019.
54. Swischuk, R., Mainini, L., Peherstorfer, B. and Willcox, K., Projection-based model reduction: Formulations for physics-based machine learning, *Computers and Fluids*, Vol. 179, pp. 704-717, January 2019.
55. Heinkenschloss, M., Kramer, B., Takhtaganov, T. and Willcox, K., Conditional-Value-at-Risk Estimation via Reduced-Order Models, *SIAM/ASA Journal on Uncertainty Quantification*, Vol. 6, Issue 4, pp. 1395-1423, 2018.
56. Cook, L., Jarrett, J. and Willcox, K., Generalized information reuse for optimization under uncertainty with non-sample average estimators, *International Journal for Numerical Methods in Engineering*, Volume 115, Issue 12, pp. 1457-1476, September 2018.
57. Qian, E., Peherstorfer, B., O'Malley, D., Vesselinov, V. and Willcox, K., Multifidelity Monte Carlo estimation of variance and sensitivity indices, *SIAM/ASA Journal on Uncertainty Quantification*, Vol. 6, No. 2, pp. 683-706, 2018. (SIAM Student Paper Prize)
58. Singh, V. and Willcox, K., Engineering Design with Digital Thread. *AIAA Journal*, Vol. 56, No. 11, pp. 4515-4528, 2018. Also in proceedings of 2018 AIAA Scitech Forum, Kissimmee, FL, January, 2018.
59. Baptista, R., Marzouk, Y., Willcox, K. and Peherstorfer, B., Optimal Approximations of Coupling in Multidisciplinary Models. *AIAA Journal*, Vol. 56, No. 6, pp. 2412-2428, 2018. (An earlier version of this work appeared in AIAA paper 2017-1935, 58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (AIAA Scitech), Grapevine, TX, January 2017.)
60. Peherstorfer, B., Kramer, B. and Willcox, K., Multifidelity preconditioning of the cross-entropy method for rare event simulation and failure probability estimation. *SIAM/ASA Journal on Uncertainty Quantification*, Vol. 6, No. 2, pp. 737-761, 2018.
61. Li, H., Garg, V. and Willcox, K. Model adaptivity for goal-oriented inference using adjoints, *Computer Methods in Applied Mechanics and Engineering*, Vol. 331, pp. 1-22, April 2018.
62. Rude, U., Willcox, K., McInnes, L.C., De Sterck, H., Biros, G., Bungartz, H., Coronas, J., Cramer, E., Crowley, J., Ghattas, O., Gunzburger, M., Hanke, M., Harrison, R., Heroux, M., Hesthaven, J., Jimack, P., Johnson, C., Jordan, K.E., Keyes, D.E., Krause, R., Kumar, V., Mayer, S., Meza, J., Mørken, K.M., Oden, J.T., Petzold, L., Raghavan, P., Shontz, S.M., Trefethen, A., Turner, P., Voevodin, V., Wohlmuth, B., and Woodward, C.S. Research and Education in Computational Science and Engineering, *SIAM Review*, Vol. 60, No. 3, 2018.
63. Curran, C., Allaire, D. and Willcox, K., Sensitivity Analysis Methods for Mitigating Uncertainty in Engineering System Design, *Systems Engineering*, published online January 2018. (Also AIAA Paper 2015-0899, 56th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Kissimee, FL, January 5-9 2015.)

64. Opgenoord, M., Drela, M. and Willcox, K., Towards a Low-Order Model for Transonic Flutter Prediction, *AIAA Journal*, Vol. 56, No. 4, pp. 1519-1531, 2018. (Also AIAA Paper 2017-4340, AIAA Theoretical Fluid Mechanics Conference Best Paper.)
65. Peherstorfer, B., Gunzburger, M. and Willcox, K., Convergence analysis of multifidelity Monte Carlo estimation, *Numerische Mathematik*, 139(3):683-707, 2018.
66. Zimmermann, R., Peherstorfer, B. and Willcox, K., Geometric Subspace Updates with Applications to Online Adaptive Nonlinear Model Reduction, *SIAM Journal on Matrix Analysis and Applications*, Vol. 39, No. 1, pp. 234-261, 2018.
67. Peherstorfer, B., Willcox, K. and Gunzburger, M., Survey of multifidelity methods in uncertainty propagation, inference, and optimization, *SIAM Review*, Vol. 60, No. 3, 2018.
68. Willcox K. and Huang, L., Network models for mapping educational data, *Design Science*, Vol. 3, e18, 2017.
69. Peherstorfer, B., Gugercin, S. and Willcox, K., Data-driven reduced model construction with time-domain Loewner models, *SIAM Journal on Scientific Computing*, Vol. 39, No. 5, pp. A2152-A2178, 2017.
70. Cook, L., Jarrett, J. and Willcox, K., Extending horsetail matching for optimization under probabilistic, interval and mixed uncertainties, *AIAA Journal*, Vol. 56, No. 2, pp. 849-861, 2018. (AIAA Student Best Paper Award)
71. Chaudhuri, A., Lam, R. and Willcox, K., Multifidelity uncertainty propagation via adaptive surrogates in coupled multidisciplinary systems. *AIAA Journal*, Vol. 56, No. 1, pp. 235-249, 2018.
72. Nguyen V.B., Dou HS., Willcox K., Khoo BC., Model order reduction for reacting flows: laminar Gaussian flame applications. In: Ben-Dor G., Sadot O., Igra O. (eds) *30th International Symposium on Shock Waves*, Springer, 2017.
73. Peherstorfer, B., Kramer, B. and Willcox, K., Combining multiple surrogate models to accelerate failure probability estimation with expensive high-fidelity models, *Journal of Computational Physics*, Vol. 341, pp. 61-75, 2017.
74. Kramer, B., Peherstorfer, B. and Willcox, K., Feedback Control for Systems with Uncertain Parameters Using Online-Adaptive Reduced Models, *SIAM Journal on Applied Dynamical Systems*, Vol. 16, No. 3, pp. 1563-1586, 2017.
75. Qian, E., Grepl, M., Veroy, K., and Willcox, K., A certified trust region reduced basis approach to PDE-constrained optimization, *SIAM Journal on Scientific Computing*, Vol. 39, No. 5 pp. S434-S460, 2017.
76. Singh, V. and Willcox, K., Methodology for Path Planning with Dynamic Data-Driven Flight Capability Estimation, *AIAA Journal*, Vol. 55, No. 8, pp. 2727-2738, 2017.
77. Spantini, A., Cui, T., Willcox, K., Tenorio, L. and Marzouk, Y. Goal-oriented optimal approximations of Bayesian linear inverse problems, *SIAM Journal on Scientific Computing*, Vol. 39, No. 5 pp. S167-S196, 2017.
78. Mainini, L. and Willcox, K., Data to decisions: Real-time structural assessment from sparse measurements affected by uncertainty, *Computers and Structures*, Vol. 182, pp. 296-312, 2017.
79. Peherstorfer, B., Willcox, K. and Gunzburger, M., Optimal model management for multifidelity Monte Carlo estimation, *SIAM Journal on Scientific Computing*, Vol. 38, No. 5, pp. A3163-A3194, 2016.
80. Amaral, S., Allaire, D., Willcox, K. and de la Rosa Blanco, E., A Decomposition-Based Uncertainty Quantification Approach for Environmental Impacts of Aviation Technology and Operation, *Artificial Intelligence for Engineering Design, Analysis and Manufacturing*, Volume 31, Issue 3 (Uncertainty Quantification for Engineering Design), pp. 251-264, August 2017.
81. Ulker, F., Allaire, D. and Willcox, K., Sensitivity Guided Decision Making for Wind Farm Micro-Siting, *International Journal for Numerical Methods in Fluids*, Vol. 83, Iss. 1, pp. 52-72, 2017.
82. Garg, V., Tenorio, L. and Willcox, K. Minimum local distance density estimation, *Communications in Statistics – Theory and Methods*, Vol. 46, No. 1, pp. 148-164, 2017.
83. Amaral, S., Allaire, D. and Willcox, K. Optimal L2-norm Empirical Importance Weights for the Change of Probability Measure, *Statistics and Computing*, 27 (3), 625-643, May 2017.

84. Opgenoord, M., Allaire, D. and Willcox, K., Variance-Based Sensitivity Analysis to Support Simulation-based Design under Uncertainty, *Journal of Mechanical Design*, Vol. 138, No. 11, pp. 111410-111410-12, 2016.
85. Zimmermann, R. and Willcox, K., An Accelerated Greedy Missing Point Estimation Procedure, *SIAM Journal on Scientific Computing*, Vol. 38, Issue 5, pp. A2827–A285, 2016.
86. Peherstorfer, B. and Willcox, K., Data-driven operator inference for nonintrusive projection-based model reduction, *Computer Methods in Applied Mechanics and Engineering*, Vol. 306, pp. 196-215, 2016.
87. Cui, T., Marzouk, Y. and Willcox, K., Scalable posterior approximations for large-scale Bayesian inverse problems via likelihood-informed parameter and state reduction, *Journal of Computational Physics*, available online 29 March 2016.
88. Peherstorfer, B. and Willcox, K., Dynamic data-driven model reduction: Adapting reduced models from incomplete data, *Advanced Modeling and Simulation in Engineering Sciences*, Vol. 3, Issue 1, 2016.
89. Opgenoord, M. and Willcox, K., Sensitivity Analysis Methods for Uncertainty Budgeting in System Design, *AIAA Journal*, Volume 54, Issue 10, pp. 3134-3148, 2016.
90. Peherstorfer, B., Cui, T., Marzouk, Y. and Willcox, K., Multifidelity importance sampling, *Computer Methods in Applied Mechanics and Engineering*, Vol. 300, pp. 490-509, 2016.
91. Benner, P., Gugercin, S. and Willcox, K., A Survey of Projection-Based Model Reduction Methods for Parametric Dynamical Systems, *SIAM Review*, Vol. 57, No. 4, pp. 483–531, 2015.
92. Peherstorfer, B. and Willcox, K., Online Adaptive Model Reduction for Nonlinear Systems via Low-Rank Updates, *SIAM Journal on Scientific Computing*, Vol. 37, No. 4, pp. A2123-A2150, 2015.
93. Peherstorfer, B. and Willcox, K., Dynamic data-driven reduced-order models, *Computer Methods in Applied Mechanics and Engineering*, Vol. 291, pp. 21-41, 2015.
94. Lecerf, M., Allaire, D. and Willcox, K. Methodology for Dynamic Data-Driven Online Flight Capability Estimation, *AIAA Journal*, Vol. 53, No. 10, pp. 3073-3087, October 2015. (An earlier version of this work appeared in AIAA Paper 2014-1175, January 2014.)
95. Peherstorfer, B. and Willcox, K., Detecting and Adapting to Parameter Changes for Reduced Models of Dynamic Data-driven Application Systems, *Procedia Computer Science*, Vol. 51, pp. 2553-2562, 2015.
96. Ng, L. and Willcox, K. Monte Carlo Information-Reuse Approach to Aircraft Conceptual Design Optimization Under Uncertainty, *Journal of Aircraft*, Vol. 53, No. 2, pp. 427-438, 2016. (An earlier version of this work appeared in AIAA Paper 2014-0802, January 2014.)
97. Mainini, L. and Willcox, K. A surrogate modeling approach to support real-time structural assessment and decision-making, *AIAA Journal*, Vol. 53, No. 6, pp. 1612-1626, 2015. (An earlier version of this work appeared in AIAA Paper 2014-1488, presented at 10th AIAA Multidisciplinary Design Optimization Conference, National Harbor, MD, January 2014.)
98. Liao, Q. and Willcox, K. A domain decomposition approach for uncertainty analysis, *SIAM Journal on Scientific Computing*, Vol. 37, No. 1, pp. A103-A133, 2015.
99. Amaral, S., Allaire, D. and Willcox, K. A decomposition-based approach to uncertainty analysis of feed-forward multicomponent systems, *International Journal for Numerical Methods in Engineering*, Volume 100, Issue 13, pages 982-1005, December 2014.
100. Ng, L. and Willcox, K. Multifidelity Approaches for Optimization Under Uncertainty, *International Journal for Numerical Methods in Engineering*, Volume 100 Issue 10, pp. 746-772, published online 17 September, 2014, DOI: 10.1002/nme.4761. (An earlier version of this work appeared in AIAA Paper 2012-5602, September 2012.)
101. Cui, T., Marzouk, Y. and Willcox, K. Data-driven model reduction for the Bayesian solution of inverse problems, *International Journal for Numerical Methods in Engineering*, Vol. 102, No. 5, pp. 966-990, published online 15 August, 2014, DOI: 10.1002/nme.4748.

102. Allaire, D. and Willcox, K. Uncertainty assessment of complex models with application to aviation environmental policy-making, *Transport Policy*, Volume 34, July 2014, pp. 109-113. Available online 20 March 2014, ISSN 0967-070X, <http://dx.doi.org/10.1016/j.tranpol.2014.02.022>.
103. Allaire, D., Kordonowy, D., Lecerf, M., Mainini, L. and Willcox, K. Multifidelity DDDAS Methods with Application to a Self-Aware Aerospace Vehicle, *Procedia Computer Science*, Vol. 29, pp. 1182-1192, 2014.
104. Allaire, D., Noel, G., Willcox, K. and Cointin, R. Uncertainty quantification of an aviation environmental toolsuite, *Reliability Engineering and System Safety*, Volume 126, June 2014, pp. 14-24. Available online 15 January 2014.
105. Nguyen, V.B., Buffoni, M., Willcox, K. and Khoo, B.C. Model reduction for reacting flow applications, *International Journal of Computational Fluid Dynamics*, Volume 28, Issue 3-4, May 2014.
106. Nguyen, N.C., Khoo, B.C. and Willcox, K. Model order reduction for Bayesian approach to inverse problems, *Asia Pacific Journal on Computational Engineering*, Vol. 1, No. 2, April 2014.
107. Lieberman, C. and Willcox, K. Nonlinear Goal-Oriented Bayesian Inference: Application to Carbon Capture and Storage, *SIAM Journal on Scientific Computing*, Vol. 36, No. 3, pp. B427-B449.
108. Peherstorfer, B., Butnaru, D., Willcox, K. and Bungartz, H.-J., Localized discrete empirical interpolation method, *SIAM Journal on Scientific Computing*, Vol. 36, No. 1, pp. A168-A192, 2014.
109. Allaire, D. and Willcox, K. A mathematical and computational framework for multifidelity design and analysis with computer models, *International Journal on Uncertainty Quantification*, Vol. 4, Issue 1, pp. 1-20, January 2014.
110. Burgiel, H., Lieberman, C., Miller, H. and Willcox, K. Interactive applets in calculus and engineering courses, chapter in *Enhancing Mathematics Understanding through Visualization: The Role of Dynamical Software*, S. Habre (Ed.), IGI Global, December 2013.
111. Kaijima, S., Bouffanais, R., Willcox, K. and Naidu, S. Computational fluid dynamics for architectural design, in *Computation Works: The Building of Algorithmic Thought*, *Architectural Design*, X. De Kestelier, B. Peters (eds), March 2013.
112. Lieberman, C. and Willcox, K. Goal-oriented inference: Approach, linear theory, and application to advection-diffusion, *SIAM Review*, Vol. 55, No. 3, pp. 493-519, 2013. (SIGEST award)
113. Lieberman, C., Fidkowski, K., Willcox, K. and van Bloemen Waanders, B. Hessian-based model reduction: Large-scale inversion and prediction, *International Journal of Numerical Methods in Fluids*, Vol. 71, pp. 135-150, January 2013.
114. Lieberman, C. and Willcox, K. Goal-oriented inference: Approach, linear theory, and application to advection-diffusion, *SIAM Journal on Scientific Computing*, Vol. 34, No.4, pp. 1880-1904, 2012.
115. Allaire, D, He, Q., Deyst, J. and Willcox, K. An Information-theoretic Metric of System Complexity with Application to Engineering System Design, *Journal of Mechanical Design*, Vol. 134, Issue 10, October, 2012.
116. March, A. and Willcox, K. A Provably Convergent Multifidelity Optimization Algorithm not Requiring High-Fidelity Derivatives, *AIAA Journal*, Vol. 50, No. 5, pp. 1079-1089, 2012.
117. March, A. and Willcox, K. Constrained multifidelity optimization using model calibration, *Structural and Multidisciplinary Optimization*, Vol. 46, pp. 93-109, 2012.
118. March, A., Wang, Q. and Willcox, K. Gradient-based Multifidelity Optimization for Aircraft Design using Bayesian Model Calibration, *The Aeronautical Journal*, Vol. 115, No. 1174, December, 2011.
119. Allaire, D. and Willcox, K. A Variance-Based Sensitivity Index Function for Factor Prioritization, *Reliability Engineering and System Safety*, Vol. 107, November 2012, pp. 107-114.
120. Allaire, D. and Willcox, K. Distributional Sensitivity Analysis, *Procedia – Social and Behavioral Sciences*, Vol. 2, Issue 6, pp. 7595-7596, 2010.

121. Stirling, L., Willcox, K. and Newman, D., Development of a Computational Model for Astronaut Reorientation, *Journal of Biomechanics*, Vol. 43, Issue 12, pp. 2309-2314, August 2010.
122. Lieberman, C., Willcox, K. and Ghattas, O., Parameter and State Model Reduction for Large-Scale Statistical Inverse Problems, *SIAM Journal on Scientific Computing*, Vol. 32, No.5, pp. 2523-2542, August 2010.
123. Frangos, M., Marzouk, Y., Willcox, K. and van Bloemen Waanders, B., Surrogate and reduced-order modeling: a comparison of approaches for large-scale statistical inverse problems, in *Computational Methods for Large-Scale Inverse Problems and Quantification of Uncertainty*, Biegler et al. (Eds.), Wiley, 2010.
124. Allaire, D. and Willcox, K., Surrogate Modeling for Uncertainty Assessment with Application to Aviation Environmental System Models, *AIAA Journal*, Vol. 48, No. 8, August 2010.
125. Galbally, D., Fidkowski, K., Willcox, K. and Ghattas, O., Nonlinear Model Reduction for Uncertainty Quantification in Large-Scale Inverse Problems, *International Journal for Numerical Methods in Engineering*, Volume 81, Issue 12, March 2010, pp. 1581-1608.
126. Degroote, J., Vierendeels, J. and Willcox, K., Interpolation among reduced-order matrices to obtain parametrized models for design, optimization and probabilistic analysis, *International Journal for Numerical Methods in Fluids*, Vol. 63, No. 2, pp. 207-230, May 2010.
127. Stirling, L., Ferguson, P., Willcox, K. and Newman, D., Kinetics and Kinematics for Translational Motions in Microgravity During Parabolic Flight. *Journal of Aviation, Space, and Environmental Medicine*, Vol. 80, No. 6, pp 522-531, June 2009.
128. Stirling, L., Newman, D. and Willcox, K., Self-Rotations in Simulated Microgravity: Performance Effects of Strategy Training, *Journal of Aviation, Space and Environmental Medicine*, Vol. 80, No. 1, pp. 5-14, January 2009.
129. Robinson, T., Willcox, K., Eldred, M., and Haines, R. Multifidelity Optimization for Variable-Complexity Design, *AIAA Journal*, Vol. 46, No. 11, pp. 2814-2822, 2008.
130. 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.
131. 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.
132. Hovland, S., Gravdahl, J., and Willcox, K., Explicit Model Predictive Control for Large-Scale Systems via Model Reduction, *AIAA Journal for Guidance, Control, and Dynamics*, Vol. 31, No. 4, July-August, 2008.
133. Astrid, P., Weiland, S., Willcox, K., and Backx, T., Missing Point Estimation in Models Described by Proper Orthogonal Decomposition, *IEEE Transactions on Automatic Control*, Vol. 53, Issue 10, pp. 2237-2251, 2008. Also presented at 43rd IEEE Conference on Decision and Control, Paradise Island, Bahamas, December 2004.
134. Bashir, O., Willcox, K., Ghattas, O., van Bloemen Waanders, B., and Hill, J., Hessian-Based Model Reduction for Large-Scale Systems with Initial Condition Inputs, *International Journal for Numerical Methods in Engineering*, Vol. 73, Issue 6, pp. 844-868, 2008.
135. Gugercin, S. and Willcox, K., Krylov Projection Framework for Fourier Model Reduction, *Automatica*, Vol. 44, No. 1, pp. 209-215, 2008.
136. Willcox, K. Model Reduction for Large-Scale Applications in Computational Fluid Dynamics, in *Real-Time PDE-Constrained Optimization*, Biegler, L., Ghattas, O., Heinkenschloss, M., Keyes, D., and van Bloemen Waanders, B. (Eds.), SIAM Book Series, pp. 217-233, 2007.
137. Bui-Thanh, T., Willcox, K., Ghattas, O., and van Bloemen Waanders, B., Goal-Oriented, Model-Constrained Optimization for Reduction of Large-Scale Systems, *Journal of Computational Physics*, Vol. 224, No. 2, pp. 880-896, June 2007.

## Karen E. Willcox, MNZM, PhD

138. My-Ha, D., Lim, K.M., Khoo, B.C. and Willcox, K., Real-Time Optimization Using Proper Orthogonal Decomposition: Free Surface Shape Prediction due to Underwater Bubble Dynamics, *Computers and Fluids*, Vol. 36, No. 3, March 2007, pp. 499-512.
139. Peoples, R. and Willcox, K., Value-Based Multidisciplinary Optimization for Commercial Aircraft Design and Business Risk Assessment, *Journal of Aircraft*, Vol. 43, No. 4, July-August, 2006, pp. 913-921.
140. Willcox, K., Unsteady Flow Sensing and Estimation via the Gappy Proper Orthogonal Decomposition, *Computers and Fluids*, Volume 35, Issue 2, February 2006, pp. 208-226.
141. Willcox, K. and Lassaux, G., Model Reduction of an Actively Controlled Supersonic Diffuser, in *Dimension Reduction of Large-Scale Systems*, Springer Series on Lecture Notes in Computational Science and Engineering, Vol. 45, Benner, P. Mehrmann, V. and Sorensen, D. (Eds.), 2005, pp. 357-361.
142. Willcox, K. and Megretski, A., Fourier Series for Accurate, Stable, Reduced-Order Models in Large-Scale Applications, *SIAM Journal on Scientific Computing*, Vol. 26, No. 3, 2005, pp. 944-962.
143. 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. 1505-16.
144. Markish, J. and Willcox, K., Value-Based Multidisciplinary Techniques for Commercial Aircraft System Design, *AIAA Journal*, Vol. 41, No. 10, October 2003, pp. 2004-12.
145. Willcox, K. and Wakayama, S., Simultaneous Optimization of a Multiple-Aircraft Family, *Journal of Aircraft*, Vol. 40, No. 4, July 2003, pp. 616-622.
146. Shapiro, B. and Willcox, K., Analyzing the Mistuning of Bladed Disks by Symmetry and Reduced-Order Aerodynamic Modeling. *Journal of Power and Propulsion*, Vol. 19, No. 2, March-April 2003, pp. 307-311.
147. Willcox, K. and Peraire J., Balanced Model Reduction via the Proper Orthogonal Decomposition. *AIAA Journal*, Vol. 40, No. 11, November 2002, pp. 2323-30.
148. Willcox, K., Peraire J. and White, J., An Arnoldi approach for generation of reduced-order models for turbomachinery. *Computers and Fluids*, Vol. 31, No. 3, pp. 369-89, March 2002.
149. Willcox, K., Peraire J. and Paduano, J., Application of Model Order Reduction to Compressor Aeroelastic Models, *Journal of Engineering for Gas Turbines and Power*, Vol. 124, No. 2, pp. 332-39, April 2002. Also Paper 2000-GT-0377, presented at the ASME International Gas Turbine and Aeroengine Technical Conference, May 2000, Munich, Germany.
150. Willcox, K. and Peraire J., Aeroelastic computations in the time domain using unstructured meshes, *International Journal for Numerical Methods in Engineering*, Vol. 40, No. 13, pp. 2413-31, July 1997.

### **Publications: Refereed Conference Papers (partial list)**

1. Pham, J., Ghattas, O. and Willcox, K. Real-time aerodynamic load estimation for hypersonics via strain-based inverse maps. AIAA Paper 2024-1228. In Proceedings of AIAA SciTech Forum & Exhibition, Orlando, FL, January 2024.
2. Geelen, R., Balzano, L. and Willcox, K. Learning latent representations in high-dimensional state spaces using polynomial manifold constructions. 62nd IEEE Conference on Decision and Control (CDC), Singapore, December 2023.
3. Kalur, A., Mortimer, P., Sirohi, J., Geelen, R. and Willcox, K. Data-driven closures for the dynamic mode decomposition using quadratic manifolds. In Proceedings of AIAA Aviation Forum, San Diego, CA, June 2023.
4. Zastrow, B., Chaudhuri, A., Willcox, K., Ashley, A. and Henson, M. Data-driven model reduction via operator inference for coupled aeroelastic flutter. In Proceedings of AIAA SciTech Forum & Exhibition, National Harbor, MD, January 2023.
5. Farcas, I.-G., Gundevia, R., Munipalli, R. and Willcox, K. Parametric non-intrusive reduced-order models via operator inference for large-scale rotating detonation engine simulations. In Proceedings of AIAA SciTech Forum & Exhibition, National Harbor, MD, January 2023.

## Karen E. Willcox, MNZM, PhD

6. Sella, V., Pham, J., Chaudhuri, A. and Willcox, K. Projection-based multifidelity linear regression for data-poor applications. In Proceedings of AIAA SciTech Forum & Exhibition, National Harbor, MD, January 2023.
7. Hyun, J., Chaudhuri, A., Willcox, K. and Kim, H.A. Multifidelity robust topology optimization for material uncertainties with digital manufacturing. In Proceedings of AIAA SciTech Forum & Exhibition, National Harbor, MD, January 2023.
8. Pham, J., Morreale, B., Clemens, N. and Willcox, K., Aerodynamic sensing for hypersonics via scientific machine learning. In Proceedings of AIAA Aviation Forum & Exhibition, Chicago, IL, June 2022. (Best Student Paper second place award)
9. Farcas, I., Munipalli, R. and Willcox, K. On filtering in non-intrusive data-driven reduced-order modeling. In Proceedings of AIAA Aviation Forum & Exhibition, Chicago, IL, June 2022.
10. Huang, L., Bicol, K. and Willcox, K. Modeling COVID-19 disruptions via network mapping of the Common Core Mathematics Standards. ASEE Annual Conference, July 2021. Computers in Education Best Paper Finalist.
11. Kapteyn, M. and Willcox, K. Predictive Digital Twins as a Foundation for Improved Mission Readiness. NATO Science and Technology Organization, Proceedings of STO-MP-AVT-355: Intelligent Solutions for Improved Mission Readiness of Military UxVs, 2021. DOI: 10.14339/STO-MP-AVT-355.
12. Kapteyn, M., Knezevic, D., and Willcox, K., Toward predictive digital twins via component-based reduced-order models and interpretable machine learning. In Proceedings of 2020 AIAA SciTech Forum & Exhibition, Orlando FL, January, 2020. (Best Student Paper Award)
13. Chaudhuri, A., Peherstorfer, B., and Willcox, K., Multifidelity Cross-Entropy Estimation of Conditional Value-at-Risk for Risk-Averse Design Optimization. In Proceedings of 2020 AIAA SciTech Forum & Exhibition, Orlando FL, January, 2020.
14. Qian, E., Kramer, B., Marques, A. and Willcox, K., Transform & Learn: A data-driven approach to nonlinear model reduction. In Proceedings of AIAA Aviation Forum & Exhibition, Dallas, TX, June 2019.
15. Chaudhuri, A., Marques, A., Lam, R., and Willcox, K., Reusing information for multifidelity active learning in reliability-based design optimization. 21st AIAA Non-Deterministic Approaches Conference (AIAA Scitech), San Diego, CA, January 2019.
16. Marques, A., Lam, R. and Willcox, K., Contour location via entropy reduction leveraging multiple information sources. Advances in Neural Information Processing Systems (NeurIPS) 31, 2018. (21% acceptance rate. Selected for spotlight presentation, 3% selection rate.)
17. Peherstorfer, B., Beran, P.S., and Willcox, K., Multifidelity Monte Carlo Estimation for Large-scale Uncertainty Propagation. In proceedings of 2018 AIAA Scitech Forum, Kissimmee, FL, January, 2018.
18. Feldstein, A., Lazzara, D., Princen, N., and Willcox, K., Model Uncertainty: A Challenge in Nonlinear Coupled Multidisciplinary System Design. In proceedings of 2018 AIAA Scitech Forum, Kissimmee, FL, January, 2018.
19. Kapteyn, M., Willcox, K. and Philpott, A. A Distributionally Robust Approach to Black-Box Optimization. In proceedings of 2018 AIAA Non-Deterministic Approaches Conference, AIAA SciTech Forum, Kissimmee, FL, January, 2018. (AIAA 2018-0666)
20. Lam, R. and Willcox, K. Lookahead Bayesian Optimization with Inequality Constraints. Advances in Neural Information Processing Systems (NIPS), pp. 1888-1898, 2017. (21% acceptance rate)
21. Mainini, L. and Willcox, K. Sensor placement strategy to inform decisions. AIAA 2017-3820, in 18th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Denver, Colorado, June 2017.
22. Willcox K. and Huang, L., Mapping the CDIO Curriculum with Network Models, in Proceedings of the 13th International CDIO Conference, University of Calgary, Calgary, Canada, June 18-22, 2017.
23. Lam, R., Willcox, K. and Wolpert, D., Bayesian Optimization with a Finite Budget: An Approximate Dynamic Programming Approach. In Advances In Neural Information Processing Systems (NIPS) 29, pp. 883-891, 2016. (24% acceptance rate)



**Karen E. Willcox, MNZM, PhD**

24. Seering, J., Huang, L. and Willcox, K., Mapping Outcomes in an Undergraduate Aerospace Engineering Program. American Society for Engineering Education, 12th Annual Conference & Exposition, June 2015.
25. Ng, L., Huynh, D.B.P. and Willcox, K., Multifidelity Uncertainty Propagation for Optimization Under Uncertainty, AIAA Paper 2012-5602, 14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Indianapolis, IN, September 2012.
26. Allaire, D. and Willcox, K., "A Bayesian-Based Approach to Multi-Fidelity Multidisciplinary Design Optimization," AIAA-2010-9183, presented at 13th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Fort Worth, TX, September 13-15, 2010.
27. Buffoni, M. and Willcox, K., "Projection-Based Model Reduction for Reacting Flows," AIAA-2010-5008, presented at 40th Fluid Dynamics Conference and Exhibit, Chicago, IL, June 28-July 1, 2010
28. Lehner, S., Lurati, L., Bower, G., Cramer, E., Crossley, W., Engelsen, F., Kroo, I., Smith, S., Willcox, K., "Advanced Multidisciplinary Optimization Techniques for Efficient Subsonic Aircraft Design," AIAA-2010-1321, presented at 48th AIAA Aerospace Sciences Meeting, Orlando, FL, Jan. 4-7, 2010.
29. Noel, G., Allaire, D., Jacobsen, S., Willcox, K., and Cointin, R., "Assessing the Uncertainty in FAA's Noise and Emissions Compliance Model," Inter-Noise Conference, Ottawa, Canada, August 23-26, 2009.
30. Noel, G., Allaire, D., Jacobsen, S., Willcox, K., and Cointin, R., "Assessment of the Aviation Environmental Design Tool," Eighth USA/Europe Air Traffic Management Research and Development Seminar (ATM2009), Napa, CA, June 29 - July 2, 2009.
31. March, A., Waitz, I., and Willcox, K. "A Methodology for Integrated Conceptual Design of Aircraft Configuration and Operation to Reduce Environmental Impact," AIAA-2009-7026, presented at 9th AIAA Aviation Technology, Integration, and Operations Conference, Hilton Head, SC, September 21-23, 2009.
32. Lazzara, D., Haimes, R. and Willcox, K. "Multifidelity Geometry and Analysis in Aircraft Conceptual Design," AIAA-2009-3806, presented at 27th AIAA Applied Aerodynamics Conference, San Antonio, TX, June 22-25, 2009.
33. Fidkowski, K., Engelsen, F., Willcox, K., and Kroo, I. "Stochastic Gust Analysis Techniques for Aircraft Conceptual Design," AIAA-2008-5848, presented at 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, September 10-12, 2008.
34. Robinson, T., Ooi, B.H., Taff, B., Willcox, K. and Voldman, J., "Surrogate-Based Optimization of a Microfluidic Weir Structure for Single-Cell Manipulation," AIAA-2008-5889, presented at 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Victoria, British Columbia, September 10-12, 2008.
35. Stirling, L., Arsie, A., Willcox, K., Frazzoli, E. and Newman, D., "Application of Quantized Control to Self-Rotation Maneuvers," 46th IEEE Conference on Decision and Control, New Orleans, LA, December 2007.
36. Allaire, D., Waitz, I. And Willcox, K., "A Comparison of Two Methods for Predicting Emissions from Aircraft Gas Turbine Engine Combustors," ASME Paper GT2007-28346, presented at the ASME International Gas Turbine and Aeroengine Technical Conference, Montreal, Canada, June 2007.
37. Allaire, D., Waitz, I. And Willcox, K., "A Comparison of Two Methods for Predicting Emissions from Aircraft Gas Turbine Engine Combustors," ASME Paper GT2007-28346, presented at the ASME International Gas Turbine and Aeroengine Technical Conference, Montreal, Canada, June 2007.
38. Bashir, O., Ghattas, O., Hill, J., van Bloemen Waanders, B., and Willcox, K., "Hessian-Based Model Reduction for Large-Scale Data Assimilation Problems," Proceedings of International Conference on Computational Science, Beijing, China, Y. Shi et al. (Eds.): ICCS 2007, Part I, LNCS 4487, pp. 1010-1017, Springer-Verlag, May 2007.
39. Stirling, L., Willcox, K. and Newman, D., "Development of Astronaut Orientation Strategies using Optimization Methodologies," Multibody Dynamics 2007, ECCOMAS Thematic Conference, Milan, Italy, June 2007.
40. Bui-Thanh, T., Willcox, K., and Ghattas, O., "Model Reduction for Large-Scale Systems with High-Dimensional Parametric Input Space," AIAA Paper 2007-2049, presented at the 48th AIAA Structures, Structural Dynamics and Materials Conference, Waikiki, HI, April 2007.

**Karen E. Willcox, MNZM, PhD**

41. Jones, A., Willcox, K., and Hileman, J., "Distributed Multidisciplinary Optimization of Aircraft Design and Takeoff Operations for Low Noise," AIAA Paper 2007-1856, presented at the 2nd AIAA Multidisciplinary Design Optimization Specialist Conference, Waikiki, HI, April 2007.
42. Hovland, S., Willcox, K., and Gravdahl, J., "MPC for large-scale systems via model reduction and multiparametric quadratic programming," 45th IEEE Conference on Decision and Control, San Diego, CA, December 2006.
43. Robinson, T., Eldred, M., Willcox, K. and Haimes, R. "Strategies for Multi-fidelity Optimization with Variable Dimensional Hierarchical Models," AIAA paper 2006-1819, presented at the 1st Multidisciplinary Design Optimization Specialist Conference, Newport, RI, April 2006.
44. Diedrich, A., Hileman, J., Tan, D., Willcox, K. and Spakovszky, Z. "Multidisciplinary Design and Optimization of the Silent Aircraft," AIAA paper 2006-1323, presented at the 44th AIAA Aerospace Sciences Meeting and Exhibit, Reno, NV, January 2006.
45. Willcox, K., Ghattas, O., van Bloemen Waanders, B., and Bader, B., "A Goal-Oriented Optimization Framework for Model Reduction of Large-scale Systems," 44th IEEE Conference on Decision and Control, Seville, Spain, December 2005.
46. 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.
47. Astrid, P., Weiland, S. and Willcox, K., "On the acceleration of a POD-based model reduction technique," Proceedings of the 16th International Symposium on Mathematical Theory of Networks and Systems, Leuven, Belgium 5-9 July 2004.
48. Willcox, K. and Bounova, G., "Mathematics in Engineering: Identifying, Enhancing and Linking the Implicit Mathematics Curriculum," presented at ASEE Annual Conference, Salt Lake City, UT, June 2004.
49. Antoine, N., Kroo, I., Willcox, K. and Barter, G. "A Framework for Aircraft Conceptual Design and Environmental Performance Studies," AIAA Paper 2004-4314, presented at the 10th AIAA Multidisciplinary Analysis and Optimization Conference, Albany, NY, August 2004.
50. Peoples, R. and Willcox, K., "A Value-Based MDO Approach to Assess Business Risk for Commercial Aircraft Design," AIAA Paper 2004-4438, presented at the 10th AIAA Multidisciplinary Analysis and Optimization Conference, Albany, NY, August 2004.
51. Gratton, D. and Willcox, K., "Reduced-Order, Trajectory Piecewise-Linear Models for Nonlinear Computational Fluid Dynamics," in Proceedings of the 5th SMA Symposium, January 2004, also AIAA Paper 2004-2329, presented at 34th AIAA Fluid Dynamics conference, Portland, OR, June 2004.
52. Peoples, R. and Willcox, K., "Value-Based Multidisciplinary Optimization for Commercial Aircraft Design," AIAA paper 2004-1542, presented at the 45th AIAA Structures, Structural Dynamics and Materials conference, Palm Springs, CA, April 2004.
53. Willcox, K. and Megretski, A., "Model Reduction for Large-Scale Linear Applications", presented at the 13th IFAC Symposium on System Identification, Rotterdam, The Netherlands, August 2003.
54. Bui-Thanh, T., Damodaran, M. and Willcox, K., "Applications of Proper Orthogonal Decomposition for Inviscid Transonic Aerodynamics", AIAA Paper 2003-4213, presented at 15th Computational Fluid Dynamics Conference, Orlando, FL, June 2003.
55. Deremaux, Y. and Willcox, K., "Real-Time Visualization and Constraint Analysis in Multidisciplinary Design Optimization", AIAA Paper 2003-3876, presented at 15th Computational Fluid Dynamics Conference, Orlando, FL, June 2003.
56. Lassaux, G. and Willcox, K., "Model reduction for active control design using multiple-point Arnoldi methods", AIAA Paper 2003-0616, presented at 41st Aerospace Sciences Meeting & Exhibit, Reno, NV, January 2003.

## Karen E. Willcox, MNZM, PhD

57. Willcox, K., "Controllable and Observable Subspaces in Computational Fluid Dynamics", in Computational fluid dynamics, 2002 (Sydney), pp. 159-164, Springer, Berlin, 2003.
58. Markish, J. and Willcox, K., "A Value-Based Approach for Commercial Aircraft Conceptual Design," in Proceedings of the ICAS2002 Congress, Toronto, Canada, September 2002.
59. Willcox, K. and Peraire, J., "Application of Reduced-Order Aerodynamic Modeling to the Analysis of Structural Uncertainty in Bladed Disks". ASME Paper GT-30680, presented at the ASME International Gas Turbine and Aeroengine Technical Conference, Amsterdam, The Netherlands, June 2002.
60. Willcox, K., Paduano, J., Peraire J. and Hall, K., "Low Order Aerodynamic Models for Aeroelastic Control of Turbomachines". AIAA paper 99-1467, presented at the 40th AIAA Structures, Structural Dynamics and Materials conference, April 1999, St Louis, MO.

### **Publications: Major Reports**

1. National Academies of Sciences, Engineering, and Medicine. 2023. Foundational Research Gaps and Future Directions for Digital Twins. Washington, DC: The National Academies Press. <https://doi.org/10.17226/26894>. (Study committee chair and lead author.)
2. National Academies of Sciences, Engineering, and Medicine. Charting a Path in a Shifting Technical and Geopolitical Landscape: Post-Exascale Computing for the National Nuclear Security Administration. The National Academies Press, Washington D.C., 2023.
3. National Academies of Sciences, Engineering, and Medicine. Data-Driven Modeling for Additive Manufacturing of Metals: Proceedings of a Workshop. The National Academies Press, Washington D.C., 2019.
4. Baker, N., Alexander, F., Bremer, T., Hagberg, A., Kevrekidis, Y., Najm, H., Parashar, M., Patra, A., Sethian, J., Wild, S., and Willcox, K. Workshop Report on Basic Research Needs for Scientific Machine Learning: Core Technologies for Artificial Intelligence, February 2019. United States. doi:10.2172/1478744. <https://www.osti.gov/servlets/purl/1478744>.
5. National Academies of Sciences, Engineering, and Medicine. 2018. Assessing the Risks of Integrating Unmanned Aircraft Systems (UAS) into the National Airspace System. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25143>.
6. Willcox, K., Sarma, S., Lippel, P. "Online Education: A Catalyst for Higher Education Reforms." Final report of the MIT Online Education Policy Initiative, April 2016.
7. Final report of the Institute-wide Task Force on the Future of MIT Education, July 2014.
8. Alexander, F., Anitescu, M., Bell, J., Brown D., Ferris, M., Luskin, M., Mehrotra, S., Moser R., Pinar, A., Tartakovsky, A., Willcox, K., Wright, S., Zavala, V. A Multifaceted Mathematical Approach for Complex Systems, Report of the DOE Workshop on Mathematics for the Analysis, Simulation, and Optimization of Complex Systems, September 2011.
9. Broderick, A., Bevilacqua, P., Crouch, J., Gregory, F., Hussain, F., Jeffers, B., Newton, D., Nguyen, D.P., Powell, J., Spain, A., Stone, R., Willcox, K., Wake Turbulence, An Obstacle to Increased Air Traffic Capacity, National Academies Press, Washington D.C., 2008.
10. Decadal Survey of Civil Aeronautics: Foundation for the Future, National Academies Press, Washington D.C., 2006. (Aerodynamics and aeroacoustics subpanel.)

### **Publications: Other**

1. Marzouk, Y. and Willcox, K., Uncertainty Quantification, in The Princeton Companion to Applied Mathematics, N.J. Higham (ed.), Princeton University Press, 2015.

## **Karen E. Willcox, MNZM, PhD**

2. Miller, H., Willcox, K. and Huang, L., Crosslinks: Improving Course Connectivity Using Online Open Educational Resources, in The Bridge, The National Academy of Sciences, Volume 46, Number 3, pp. 38-44, Fall 2016.

### **PhD Students Supervised**

1. Patricia Astrid, TU Eindhoven PhD 2004. Now at Shell Global Solutions.
2. Tan Bui-Thanh, MIT PhD 2007. Now Associate Professor of Aerospace Engineering and Engineering Mechanics, UT Austin.
3. Theresa Robinson. MIT PhD 2007. Now at Rolls Royce.
4. Leia Stirling, MIT PhD 2008. Now Associate Professor of Industrial and Operations Engineering, University of Michigan.
5. Svein Hovland, Norwegian University of Science and Technology PhD 2008. Now at Frontier International.
6. Doug Allaire, MIT PhD 2009. Now Associate Professor of Mechanical Engineering, Texas A&M University.
7. Van Bo Nguyen, National University of Singapore PhD 2011. Now at A\*STAR Institute for High Performance Computing.
8. David Lazzara, MIT PhD 2012. Now at The Boeing Company.
9. Andrew March, MIT PhD 2012. Now at MIT Lincoln Laboratory.
10. Ngoc Hien Nguyen, National University of Singapore PhD 2012. Now at National University of Singapore.
11. Chad Lieberman, MIT PhD 2013. Now at Chad E Lieberman Consulting.
12. Leo Ng, MIT PhD 2013. Now at Mathworks.
13. Chelsea Curran (He), MIT PhD 2014. Now at MIT Lincoln Laboratory.
14. Sergio Amaral, MIT PhD 2015. Now at Millenium Management.
15. Brian Cohen, MIT PhD 2018. Now at MIT Lincoln Laboratory.
16. Remi Lam, MIT PhD 2018. Now at DeepMind.
17. Max Opgenoord, MIT PhD 2018. Now at Amazon.
18. Harriet Li, MIT PhD 2019. Now at Johns Hopkins University Applied Physics Laboratory.
19. Victor Singh, MIT PhD 2019. Now at The Boeing Company.
20. Elizabeth Qian, MIT PhD 2021. Now Assistant Professor at Georgia Tech.
21. Michael Kapteyn, MIT PhD 2021. Now at UT Austin.
22. Sean McBane, UT Austin PhD 2022. Now at Cadence.
23. Shane McQuarrie, UT Austin PhD 2023. Now von Neumann Fellow at Sandia National Laboratories.

### **Postdoctoral Researchers Supervised**

1. Doug Allaire (MIT). Now Associate Professor, Texas A&M University.
2. Kayla Bicol (MIT). Now at CenterPoint Energy.
3. Marcelo Buffoni (MIT). Now at ABB Switzerland Ltd.
4. Anirban Chaudhuri (MIT). Now Research Associate at UT Austin.
5. Laurence Cook (MIT). Now at Arrival.
6. Tiangang Cui (MIT). Now Lecturer, Monash University.
7. Sonjoy Das (MIT). Now Adjunct Associate Professor, University at Buffalo.
8. Ionut Farcas (UT Austin). Now Assistant Professor, Virginia Tech.
9. Krzysztof Fidkowski (MIT). Now Professor, University of Michigan.
10. Michalis Frangos (MIT). Now at Red Bull Technologies/Formula 1.
11. Vikram Garg (MIT). Now at Esgee Technologies.

**Karen E. Willcox, MNZM, PhD**

12. Mengwu Guo (UT Austin). Now Assistant Professor, Twente University.
13. Phuong Huynh (MIT). Now Head of Operation and Research, Akselos.
14. Aniketh Kalur (UT Austin). Now Assistant Professor, IIT Madras.
15. Michael Kapteyn (UT Austin). Now Research Associate at UT Austin.
16. Parisa Khodabakhshi (UT Austin). Now Assistant Professor, Lehigh University.
17. James Koch (UT Austin). Now Staff Scientist at Pacific Northwest National Laboratory.
18. Boris Kramer (MIT). Now Assistant Professor, University of California, San Diego.
19. Remi Lam (MIT). Now at DeepMind.
20. Qifeng Liao (MIT). Now Associate Professor, ShanghaiTech University.
21. Chad Lieberman (MIT). Now at Chad E Lieberman Consulting.
22. Laura Mainini (MIT). Now Chaired Professor at Imperial College.
23. Alexandre Marques (MIT). Now at MaxLinear.
24. Benjamin Peherstorfer (MIT). Now Associate Professor, Courant Institute, New York University.
25. Marco Tezzele (UT Austin). Now Assistant Professor, Emory University.
26. Demet Ulker (MIT). Now at DASH Systems.
27. Ralf Zimmermann (MIT). Now Associate Professor, University of Southern Denmark.