Statistical and Data-driven Methods for Additive Manufacturing Qualification

Committee

Thomas R. Kurfess

Chair

Thomas R. Kurfess [NAE] is the HUSCO/Ramirez Distinguished Chair in Fluid Power and Motion Control and Professor of Mechanical Engineering at Georgia Tech. During 2019-2021 he was on leave serving as the Chief Manufacturing Officer and the Founding Director for the Manufacturing Science Division at Oak Ridge National Laboratory, where he was responsible for strategic planning in advanced manufacturing. During 2012-2013 he was on leave serving as the Assistant Director for Advanced Manufacturing at the Office of Science and Technology Policy in the Executive Office of the President of the United States of America. He was President of the Society of Manufacturing Engineers in 2018, and currently serves on the Board of Governors of the ASME. His research focuses on the design and development of advanced manufacturing systems targeting secure digital manufacturing, additive and subtractive processes, and large-scale production enterprises. Kurfess is a member of the National Academy of Engineering and is a Fellow of ASME, AAAS, and SME. He received his S.B., S.M. and Ph.D. degrees in mechanical engineering from M.I.T. in 1986, 1987 and 1989, respectively. He also received an S.M. degree from M.I.T. in electrical engineering and computer science in 1988.

Wei Chen

Member

Wei Chen is the Wilson-Cook Chair Professor in Engineering Design at Northwestern University and a faculty in Department of Mechanical Engineering. As the director of the Integrated DEsign Automation Laboratory (IDEAL), her current research involves issues such as simulation-based design under uncertainty; model validation and uncertainty quantification; data science in design and advanced manufacturing; stochastic multiscale analysis and materials design; design of metamaterials; multidisciplinary design optimization; consumer choice modeling and decision-based design. She is the co-founder and director of the interdisciplinary doctoral cluster in Predictive Science and Engineering Design (PS&ED), and serves as the co-director for the Design Cluster affiliated with the Segal Design Institute at Northwestern. Dr. Chen received her Ph.D. in mechanical engineering from the Georgia Institute of Technology in 1995. She was an elected member of National Academy of Engineering (2019).

Teresa Clement

Member

Teresa Clement is a Senior Principal Systems Engineer at Raytheon. She earned her BSE in 2002, and her Ph.D in 2007, both from Arizona State University in Materials Science Engineering. She has also been the chair of the Governance Board and Executive Committee for America Makes (the National Additive Manufacturing Innovation Institute). Previously at Raytheon she has held the role as Corporate Technology Area Director for Mechanical, Materials, and Structures as well as Value Stream Manager. She has also been a Graduate Research Assistant at Arizona State University, a Graduate Intern at Sandia National Laboratories and a Undergraduate Intern at Motorola Semiconductor Corp. Dr. Clement has several patents to her name.

Maria Emelianenko

Member

Maria Emelianenko is a Professor at George Mason University. She is an interdisciplinary mathematician whose work is focused on applying mathematical theory to a wide range of applied problems. She serve as a Director of the Industrial Immersion program and a Director of Graduate Studies for the Mathematics department. Her current research lies at the interface between mathematics and other areas of science and engineering, such as materials science, chemistry and biology. She has developed new predictive models and simulations for smart materials design and design fast data analysis algorithms in collaboration with interdisciplinary colleagues. Her research is problem driven and utilizes a wide spectrum of mathematical tools from optimization, numerical analysis, stochastic processes, PDEs and statistics.

Eric Fodran

Member

Eric Fodran is a manufacturing engineer and metallurgist within the Manufacturing Technologies Innovation organization within the Northrop Grumman Corporation here in Southern California. He has been supporting R&D efforts within the Manufacturing Technology Innovation organization as well as Advanced Materials & Process Development organizations for the past 20 years on several aircraft platforms including F-35, F-18, B-2, T-38, as well as classified, future air and space systems. His focus has been predominantly in the areas of additive manufacturing, structural materials fabrication and processing methods, as well as corrosion prevention and high temperature thermal protection systems. His practical experience has also been based in lunar rover metallic materials while at the NASA Jet Propulsion Facility, and his previous R&D background has been in a diverse spectrum of processes and materials including: elevated temperature aluminum based alloys and intermetallics, rapid solidification processing methods, and amorphous bulk materials for structural application.

Mike Haley

Member

Mike Haley is the Senior Vice President of Research at Autodesk, Inc. He leads the world-class Autodesk Research group uncovering how new technologies can transform the ways their customers design and make the world around us while also responding to challenging concerns like climate change, automation and industry convergence. The Autodesk Research team consists of academic research (AI, Human-Computer Interaction, Simulation and Systems, Optimization, Geometry, Visualization and Robotics), industry research (Design, Manufacturing, Architecture, Infrastructure, Construction and Media), strategic foresight and our technology centers where we collaborate with customers and partners on the future of design and making. All these functions come together to create a multidisciplinary and integrated research and foresight function that guides Autodesk's future technology, product strategy and product capabilities. In addition, with a background in Machine Learning, Mike leads Autodesk's efforts in Generative AI. Mike has led many technology and product transformation efforts at Autodesk. He established and directed Autodesk’s Machine Learning competency by establishing our AI Lab. Prior to that Mike led the early development of Autodesk’s cloud technology and infrastructure. Mike has a background in computer-graphics, machine learning, distributed systems and mathematical analysis. He holds an MS in Computer Science from the University of Cape Town, South Africa.

Ade Makinde

Member

Ade Makinde is the Principal Simulation Engineer at VulcanForms, Inc., a manufacturer of additive manufacturing machines. Previously he was a principal engineer at the GE Global Research Center. In this role, he supervised researchers in the use of finite element analysis, computational fluid dynamics, and the development of specialized numerical and microstructural tools to optimize manufacturing processes and part design for manufacturability. He was also part of the management staff responsible for overseeing the development of analytical tools and processes to aid the design of new products and parts for all of GE’s businesses. Makinde worked closely with GE’s suppliers using analytical tools to solve time-sensitive technical issues and to ensure that yield and quality targets were met.

Ralph G. Nuzzo

Member

Ralph G. Nuzzo (NAS) is the G. L. Clark Professor of Chemistry Emeritus at the University of Illinois at Urbana Champaign. He is the author or coauthor of more than 350 peer-reviewed papers and 48 awarded U.S. Patents. Most recently (until 2022) he was the G. L. Clark Professor of Chemistry at the University of Illinois at Urbana-Champaign, a faculty he joined in 1991 and where he also held an appointment as a Professor of Materials Science and Engineering. In 2014 he was appointed as an affiliated member of the Chemistry Faculty at the KTH Royal Institute of Technology in Stockholm Sweden. He is currently a Faculty Associate in Applied Physics and Materials Science at The California Institute of Technology, where he served as the Director of the Department of Energy Light-Materials Interactions in Energy Conversion Energy Frontier Research Center. He also was appointed as a faculty visitor in Chemistry at Harvard University in 2022. Professor Nuzzo received an AB degree with High Honors and Highest Distinction in Chemistry from Rutgers College in 1976 and earned a Ph.D. in Organic Chemistry from The Massachusetts Institute of Technology in 1980. He accepted the position of Member of Technical Staff in Materials Research at Bell Laboratories in Murray Hill, NJ in 1980, where he was named a Distinguished Member of the Staff in Research in 1987. He joined the Illinois faculty in 1991. He is an elected Member of the National Academy of Sciences, the American Academy of Arts and Sciences, and the Norwegian Academy of Science and Letters. He is a Fellow of the American Association for the Advancement of Science, the American Chemical Society, the American Vacuum Society, and the Royal Society of Chemistry. He was named the Kavli Laureate in Nanotechnology in 2022. His other awards include the Forschungspreis of the Alexander von Humboldt Foundation, co-recipient of the George E. Smith Award of the IEEE, co-recipient of the Wall Street Journal Innovators Award for Semiconductors, and the Adamson Award of the American Chemical Society.

Adrian Onas

Member

Adrian S. Onas is Professor of Naval Architecture at the Webb Institute of Naval Architecture. Professor Onas has over twenty-five years of experience in the Maritime Industry in Europe and the United States. His work includes dealing with ships and mobile offshore units classification plan approval, certification of materials, components and systems, newbuilding surveys including sea trials, shipyard and marine product quality assessments. Part of the process includes additive manufacturing of complex marine propulsion shapes and their analysis. Research experience with nonlinear ship motion program WASIM, including time-domain simulations of roll decay, forced roll and parametric roll resonance in regular seas; frequency-domain simulation experience, including the study of trimaran roll response in beam/oblique seas and the resonant wave trapping modes in forced roll and forced heave oscillations. Investigated two nonlinear roll damping models using forced roll tests with a specially designed forced roll apparatus.

Melissa E. Orme

Member

Melissa Orme, PhD, Vice President, The Boeing Company, oversees Additive Manufacturing activity across the three Boeing business units: Boeing Commercial Airplanes; Boeing Defense, Space and Security; and Boeing Global Services; including metal and polymer flight hardware, as well as research and factory aids to enable product development and increase factory efficiency. Orme is also responsible for guiding the development of the digital thread across the Additive Manufacturing value chain, and the implementation of data driven models from extracted and archived data from the digital thread, utilizing machine learning and artificial intelligence to drive efficiency, quality, and scale within the Additive Manufacturing end-to-end value stream. Other key responsibilities include the development of initiatives geared towards quantifying the positive sustainability trades associated with Additive Manufacturing. Orme has a diverse professional background and began her career in academia, where she rose to the rank of Full Professor at the University of California, Irvine. Dr. Orme has deep experience in technology development through the diverse frameworks of academia, small business, and large corporations. Orme received her PhD, M.S., and B.S. in Aerospace Engineering from the University of Southern California.

Alyson G. Wilson

Member

Alyson Wilson is the Associate Vice Chancellor for National Security and Special Research Initiatives at North Carolina State University. She is also a professor in the Department of Statistics and principal investigator for the Laboratory for Analytic Sciences. She is a Fellow of the American Statistical Association and the American Association for the Advancement of Science. Her research interests include statistical reliability, and Bayesian methods. Prior to joining NC State, she was a research staff member at the IDA Science and Technology Policy Institute (2011-2013); an associate professor in the Department of Statistics at Iowa State University (2008-2011). In addition to numerous publications, she has co-authored a book, Bayesian Reliability, and has co-edited two other books, Statistical Methods in Counterterrorism: Game Theory, Modeling, Syndromic Surveillance, and Biometric Authentication and Modern Statistical and Mathematical Methods in Reliability. Dr. Wilson received her Ph.D. in Statistics from Duke University.