DR. MATTHEW S. ALLEN

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EDUCATION

Atlanta, Georgia **Georgia Institute of Technology** 2001 – 2005

Ph.D./M.S. in Mechanical Engineering: GPA 4.0/4.0.

- Ph.D. Thesis: "Global and Multi-Input-Multi-Output (MIMO) Extensions of the Algorithm of Mode Isolation (AMI)" **Advisor:** Dr. Jerry H. Ginsberg
- Doctorate degree received May 7, 2005.

Provo, Utah **Brigham Young University** 1994 – 95, 98 – 2001

B.S. in Mechanical Engineering: Magna Cum Laude

- Research in Vibrations, Materials Science and Heat Transfer.

RESEARCH / PROFESSIONAL EXPERIENCE

Brigham Young University, *Professor* 2021 – present
Mechanical Engineering Department
University of Wisconsin-Madison, *Professor, Engineering Physics Dept.* 2019 – 2021
University of Wisconsin-Madison, *Associate Professor, EP Dept.* 2013 – 2019
University of Wisconsin-Madison, *Assistant Professor, EP Dept.* 2007 – 2013

Dr. Allen has been the principal investigator on over $3.5M of funded research ($5.7M if funds expended by others are included). Major projects are listed below and some results are highlighted. Amounts are all the funds expendable by Allen except as noted.

CURRENT/PENDING PROJECTS

- "Extending a Smart Environmental Test Approach," PI, Kansas City National Security Campus, 2020-2021, $49,000.
- "Extension to Spidered Representations for Linear and Nonlinear Contact at Bolted Joints (year 4)," PI, Sandia National Laboratories, 2020-2021, $75,000.
- "System ID for Nonlinear Systems," PI, Sandia National Laboratories, 2020-2021, $75,000.
- "Noninvasive assessment of in vivo tissue loads to enhance the treatment of gait disorders," PI-Thelen, CIs-Allen, Schwartz, Novacheck & Ledoux, *National Institutes of Health*, 2017-2022, $123k, (Allen's estimated share, the total budget is approx $1.8M).

OTHER PROJECTS

- Invited to be a member of the NASA Engineering and Safety Center (NESC) Loads and Dynamics Technical Discipline Team.
  - Supporting efforts to construct forcing functions for NASA Space Launch System (SLS) during roll-out.
  - Proposed an augmentation method that will estimate the fixed-interface modes of the SLS from test measurements in the Vehicle Assembly Building (VAB).

PAST PROJECTS

- "MRI: Acquisition of a Multipoint Laser Vibrometer for Studying Multiscale and Nonstationary Dynamics of Materials and Complex Structures," *co-PI*, *National Science Foundation*, 2017-2020, $155k (Allen's estimated share, the total budget is $470,250 plus $100k UW-Madison cost share).
- "Testing And Model Updating For Geometrically Nonlinear Hypersonic Vehicle Assemblies Using Nonlinear Normal Modes," PI, *Air Force Office of Scientific Research, 2017-2020,* $455,793
- "New Nonlinear Modal Analysis Framework for Multi-Scale Modeling of Structures with Bolted Interfaces," co-PI, *National Science Foundation*, 2016-2018, $332,000
- "Extension to Spidered Representations for Linear and Nonlinear Contact at Bolted Joints," *PI, Sandia National Laboratories, 2018-2020, $147,000.*
- "Exploring Methods for Implementing Experimental Modal Models in Abaqus," *PI, Sandia National Laboratories, 2018-2020, $150,000.*
- "Multi-Input-Multi-Output (MIMO) Active Vibration Control (year 4)," *PI, Kansas City National Security Campus, 2018-2020, $151,000.*
- "Linear and Nonlinear Exploration of Spidered Representations for Contact at Bolted Joints," *PI, Sandia National Laboratories, 2017-2018, $70,000.*
- "Multi-Input-Multi-Output (MIMO) Active Vibration Control (year 2)," *PI, Kansas City National Security Campus, 2017-2018, $90,000.*
- "Experimental-Analytical Substructuring To Characterize Nonlinear Response Of Environmental Tests Systems," *PI, Kansas City National Security Campus, 2017-2018, $80,000.*
- "A New Benchmark Structure for Measuring and Predicting Nonlinear Joint Behavior," *PI, Sandia National Laboratories, 2016-2017, $36,609*
- "Multi-Input-Multi-Output (MIMO) Active Vibration Control," *PI, Kansas City National Security Campus, 2016-2017, $122,273*
- "Experimental Shaker Substructuring," *PI, Kansas City National Security Campus, 2016-2017, $40,000*
- "Nonlinear Substructuring with Weakly Nonlinear Joints," *co-PI, Sandia National Laboratories, 2015-2016, $80,000*
- "Structural Dynamic Output Metrics," *PI, Sandia National Laboratories, 2015-2016, $65,683*
- "Identification of Nonlinear Substructure Models," *co-PI, Sandia National Laboratories, 2014-2015, $56,000*
- "Tools to Enable Industrial Application of Experimental Substructuring with Craig Bampton Models," *co-PI, Sandia National Laboratories, 2013-2014, $82,000*
- "Advanced Bases for the Transmission Simulator method of Experimental-Analytical Substructuring," *co-PI, Sandia National Laboratories, 2012-2013, $35,000*
- "Evaluation of CSLDV for Force Reconstruction at Bolted Interfaces," *PI, Sandia National Laboratories, 2012-2013, $10,000*
- "Exploring the Effect of Uncertainty on Experimental / Analytical Substructuring Predictions," *co-PI, Sandia National Laboratories, 2011-2012, $35,000*

- "Metrics for Diagnosing Negative Mass in Experimental/Analytical Substructuring," *co-PI, Sandia National Laboratories, 2010-2011, $45,000*
- "Substructuring with Nonlinear Subcomponent Models Based on Nonlinear Normal Modes with Application to Hypersonic Vehicle Design," *PI, Young Investigator Program, Air Force Office Of Scientific Research, Program Manager: David Stargel, 2011-2014, $364,180*
    - Studying nonlinear vibration of assemblies of subcomponents and strategies for extracting nonlinear models from finite element codes. The project aims to facilitate the design of hypersonic vehicle skin panels.
- "Method for Experimental Identification of Nonlinear Dynamic Systems of Unknown Form and Order with Application to Human Gait," *PI, National Science Foundation, Program Manager: Eduardo Misawa, 2010-2013, $279,982*
    - Developing system identification technique that determines the order, model form and parameters of nonlinear dynamic systems by approximating them as linear time-periodic over a certain limit cycle.
    - These methods are being used to seek to obtain a better understanding of neuro-muscular function in human gait.
- "Develop Process to Estimate the Noise Floor of Various Torsional Vibration Sensors," *PI, Cummins Power Generation, 2010, $29,620*
- "Experimental/Analytical Substructuring under Uncertainty," *co-PI, Sandia National Laboratories, 2009-2010, $46,151*
- "Coupling/Uncoupling of Field and Laboratory Structures and Modal Substructure Expansion," *co-PI, Sandia National Laboratories, 2008-2009, $30,002*
- Continuous Scan Laser Doppler Vibrometry, Supported by University of Wisconsin-Madison Startup Funds
- "Stochastic Analysis of Test Analysis Model (TAM) Correlation for Aircraft," *PI, Air Force Office of Scientific Research, 2008, ~$15k*
- "Stochastic Analysis of Test-Analysis Models," *PI, supported by Sandia National Laboratories, 2007-2008, $21,888*
- "Characterization of Nonlinear Microsystems using Laser Doppler Vibrometer (LDV) Measurements," *PI, Sandia National Laboratories, 2007-2008, $26,330*
    - Discovered previously unmodeled effects that can cause atomic force microscope calibration to be in error by more than 100%. Developing approaches to correct for these errors, enabling accurate force measurement in nano-scale systems.
- "Experimental/Analytical Substructure Coupling," *PI, Sandia National Laboratories, 2007-2008, $21,888*
    - Enabled more accurate and efficient modeling of structures composed of subsystems by developing the Modal Constraints for Fixture and Subsystem (MCFS) method of connecting subcomponent models, which reduces the sensitivity of coupled system predictions to experimental errors.
    - This work enabled us to predict the response of a complicated structure made up of subcomponents that join through a statically indeterminate multi-point connection.

Sandia National Laboratories, *Postdoctoral Appointee* 2005 – 2006

- Nonlinear Vibration
  - Developed method to characterize nonlinear response of micro-cantilevers to support squeeze film damping modeling efforts.
  - Investigated time-domain methods for detecting nonlinearity in transient (shock) response data.
- Uncertainty Quantification and Model Validation
  - Optimized control waveforms for radio-frequency micro-electro mechanical switches with uncertain physical parameters.
  - Developed methods for modeling the response of nonlinear dynamic systems to nonstationary, non-Gaussian input.
  - Evaluated techniques for modeling dynamic systems with stochastic parameters using finite element models. Methods studied include Latin Hypercube Sampling, reliability methods (FORM/SORM) and stochastic finite elements. (Joint effort with Lockheed Martin)
  - Explored new methods for validating models in the presence of variability, ignorance, and incomplete information.
- Force Reconstruction and Admittance Modeling
  - Developed new time domain methods for identifying the forces acting on a structure from response measurements. Compared these and existing methods to classical frequency domain techniques.
  - Characterized uncertainty and experimental issues in admittance modeling for automobiles. Joint project between SNL and Goodyear.

Georgia Institute of Technology 2001 – 2005

- Experimental Modal Analysis (EMA), Vibrations
  - Created a global Multi-Input-Multi-Output (MIMO) extension to the Algorithm of Mode Isolation (AMI). The resulting algorithm estimates the natural frequencies, damping ratios and mode shapes of vibratory systems from experimentally measured vibration data in the presence of significant measurement noise, as may be present in damage detection or condition monitoring applications.
  - Applied AMI algorithms to detect damage and manufacturing defects in computer chips ("flip-chips") and timber highway-bridge pilings.
  - Incorporated concepts from nonlinear optimization into MIMO-AMI. Careful attention to computational efficiency resulted in an algorithm that is capable of quickly processing data from hundreds of input – output combinations simultaneously.
  - Investigated systems with close natural frequencies, mode localization and high noise and applied knowledge of the vibratory phenomena to algorithm development.
  - Studied and applied advanced signal processing and statistical concepts such as bias error in spectral and frequency response function estimation, confidence intervals, etc…

- Controls, Dynamic Systems
  - Implemented modern system identification algorithms such as the Stochastic Subspace (SSI) and pLSCF (or Polymax®) algorithms and found the extensions of AMI to compare favorably with these.

Patterned Fiber Composites, Lindon, UT 2000 – 2001

- Testing of Composite Materials, Design of Composite Structures, Finite Element Analysis (FEA), Damping, Vibrations
  - Found that time-temperature superposition could be applied to damped wavy composite materials and implemented frequency/temperature testing, greatly increasing our understanding of how wavy composite materials perform.
  - Helped in developing a novel dynamic testing apparatus with temperature control for carbon-fiber composite materials that exhibit extremely high damping.
  - Designed highly damped composites for aerospace and sporting goods applications. (See our golf club at www.nr-golf.com. The "Wright Flyer" replica airplane, featured on the Discovery Channel, also used these materials http://wrightflyer.usurf.usu.edu/)
  - Performed FEA simulations and correlated FEA results to test data.
  - Designed structural modifications to manufacturing equipment.

Center for Advanced Friction Studies, Carbondale, IL Summer 1999

- Materials Science: Carbon/Carbon Composites, Heat Transfer
  - Worked in research of Carbon/Carbon fiber composites graphitized using a chemical vapor deposition technique (CVD) for use as friction materials in aircraft braking systems.

TEACHING

University of Wisconsin-Madison 2007 – present

- Vibrations of Mechanical Systems (EMA/EP/ME 545)
  - Vibrations of linear single and multi-degree of freedom systems, Lagrange's equations, modal analysis, Ritz method for continuous systems, etc…
  - Text: "Mechanical and Structural Vibrations," Jerry H. Ginsberg, 2001.
- Experimental Vibrations (EMA/ME 540)
  - Junior-Senior level course concerned with experimental techniques for dynamic systems including experimental modal analysis, operational modal analysis, vibration sensors (e.g. accelerometers, laser vibrometers, strain gauges, etc…)
- Advanced Dynamics (EMA/ME 542)
  - Junior-Senior level course covering 3D rigid body dynamics including Moving/Rotating reference frames, Euler's equations, etc…
  - Text: "Advanced Dynamics," 3rd ed. Jerry H. Ginsberg, 2008.
- Nano-Mechanics (EMA 615) co-taught with Prof. Wendy Crone.
  - Applications of mechanics and materials to nanoscale and MEMS systems

- Taught modules on Atomic Force Microscopy (AFM), uncertainty analysis in MEMS, dynamics applications and thermal vibration in MEMS and AFM.

AWARDS RECEIVED

- Young Investigator Award, Air Force Office of Scientific Research (AFOSR), 2011.
- ASEE/AFOSR Summer Faculty Research Associate, WPAFB, 2008.
- National Science Foundation (NSF) Graduate Research Fellowship – 2002
- Best Student Paper Award, 148th Meeting of the Acoustical Society of America, 2004.
- Achievement Rewards for College Scientists (ARCS) Fellowship – 2003
- Georgia Tech George W. Woodruff Fellowship – 2001
- Georgia Tech Presidential Fellowship – 2001
- Academic Scholarship from Brigham Young University – 1998
- Elected to Tau Beta Pi, Phi Kappa Phi & Golden Key Honor Societies.
- Eagle Scout Award from the Boy Scouts of America – 1993

PROFESSIONAL ASSOCIATIONS

- Society for Experimental Mechanics (SEM)
- American Society of Mechanical Engineers (ASME)
- American Institute of Astronautics and Aeronautics (AIAA)
- Acoustical Society of America (ASA)

SERVICE TO PROFESSIONAL ASSOCIATIONS

- Chair of the SEM Substructuring Focus Group, which plans conference activities and coordinates research for approximately 50 interested researchers (Member 2012-2018, Vice Chair 2018-2020, Chair 2020-present).
- Associate Editor, Experimental Techniques (SEM Journal), (2019-present).
- Involved in the organization of the International Modal Analysis Conference (2009-present). Organize and chair at least one session per year.
- Member of the Society for Experimental Mechanics (SEM) Executive Committee, (2017-2020).
- Advisory Board member for the SEM International Modal Analysis Conference (2012-2020). Future Conference Committee member.
- Regularly chair sessions at the AIAA Structural Dynamics and Materials (SDM) Conference / AIAA-SciTech and at the ASME International Design Engineering Technical Conference (IDETC).
- Member of the ASME Technical Committee on Vibration and Sound, (2012-2018). Liaison with SEM, chair best student paper award committee.
- Associate Editor for ASME Journal of Vibration and Acoustics, (2015-2018).
- Guest Editor/Organized special issue for Mechanical Systems and Signal Processing.

CITIZENSHIP / SECURITY CLEARANCE

- Citizenship: United States Citizen (USA)
- Previously held Department of Energy (DOE) Q-clearance

BOOKS & BOOK CHAPTERS

- The Mechanics of Jointed Structures, Editor: Matthew R. W. Brake, 2018.
  - The Ampair 600 Wind Turbine: An In-Context Benchmark System, Daniel R. Roettgen & Matthew S. Allen

- Modal Iwan Models for Structures with Bolted Joints, Matthew S. Allen, Brandon J. Deaner & Daniel J. Segalman.

- Substructuring in Engineering Dynamics: Emerging Numerical and Experimental Techniques, Matthew S. Allen, Daniel Rixen, Maarten van der Seijs, Paolo Tiso, Thomas Abrahamsson and Randall L. Mayes, Springer, 2019, CISM International Centre for Mechanical Sciences, ISBN 978-3-030-25531-2 ISBN 978-3-030-25532-9 (eBook), https://doi.org/10.1007/978-3-030-25532-9
- Paolo Chiariotti, Christian Rembe, Paolo Castellini, and Matt Allen, "Laser Doppler Vibrometry Measurements in Structural Dynamics," Springer, New York, NY, (The Society for Experimental Mechanics), 2020, https://doi.org/10.1007/978-1-4939-6503-8

PATENTS

- "Apparatus For Dynamic Stress Measurement," Thelen, Martin, Allen, Segalman & Slane, US Patent # 10631775, Issued 4/28/2020.

PUBLICATIONS: HTTP://SD.ENRG.WISC.EDU

Refereed Journal Papers

64.) Aabhas Singh, Matthew S. Allen & Robert J. Kuether, "Multi-mode Quasi-static Excitation for Systems with Nonlinear Joints," Mechanical Systems and Signal Processing, (Submitted May 2021).

63.) Iman Zare & Matthew S. Allen, "Extension of the Harmonic Balance Method for Dynamic Systems with Iwan Joints," Mechanical Systems and Signal Processing, (Submitted Jan 2020).

62.) Mitchell Wall, Robert J. Kuether & Matthew S. Allen, "Observations of Modal Coupling due to Bolted Joints in an Experimental Benchmark Structure," Mechanical Systems and Signal Processing, (Submitted Dec 2020, Accepted 4/11/2021).

61.) Kwarta, Michal K. & Matthew S. Allen, "Nonlinear Normal Mode Backbone Estimation with Near-Resonant Steady State Inputs," Mechanical Systems and Signal Processing, (Submitted Dec 2020, Accepted 5/11/2021).

60.) Iman Zare & M.S. Allen, "Time-Domain Numerical Continuation of Periodic Orbits for Harmonically Forced Hysteretic Nonlinear Systems," Journal of Sound and Vibration, (Submitted September 2020).

59.) Schumann, Christopher A; Matthew S. Allen; Matthew Tuman & Washington J Delima, "Transmission Simulator Based MIMO Response Reconstruction," Experimental Techniques, (Accepted Feb 2021). http://dx.doi.org/10.1007/s40799-021-00454-4.

58.) Aabhas Singh; Matthew S Allen; Melissa Schmidt-Landin; Washington J Delima, "Multi–Input Multi–Output Hybrid Active Vibration Control for High Frequency Random Vibration," Experimental Techniques, (Submitted Oct 2020, Accepted 3/16/2021).

57.) Francesco Latini, Jacopo Brunetti, Walter D'Ambrogio, Matthew S. Allen, Annalisa Fregolent, "Nonlinear substructuring in the modal domain: numerical validation and experimental verification in presence of localized nonlinearities," Nonlinear Dynamics, (Submitted November 2020, Accepted 3/10/2021), https://doi.org/10.1007/s11071-021-06363-w.

56.) Dario Di Maio; Paolo Castellini; Milena Martarelli; Steve J Rothberg; Matthew S Allen; Weidong D Zhu; David J Ewins, "Continuous Scanning Laser Vibrometry: A Raison d'être and Applications to Vibration Measurements," Mechanical Systems and Signal Processing, Volume 156, July 2021, 107573, https://doi.org/10.1016/j.ymssp.2020.107573.

55.) Iman Zare, M. Wall & M.S. Allen, "Adapting a Contact-Mechanics Algorithm to Predict Damping in Bolted Joints using Quasi-Static Modal Analysis," Journal of Mechanical Sciences, Volume 189, 1 January 2021, 105982, https://doi.org/10.1016/j.ijmecsci.2020.105982.

54.) K. Park & M.S. Allen, "Quasi-static modal analysis for reduced order modeling of geometrically nonlinear structures," Journal of Sound and Vibration, (Accepted 3/8/2021).

53.) D.D. Shetty & M.S. Allen, "Fast Simulation of a Single Degree-of-Freedom system consisting of an Iwan element using the Method of Averaging," ASME Journal of Vibrations and Acoustics, Vol. 142, pp. 051107-1, Oct 2020.

52.) M. Scheel et al., "Experimental Assessment of Polynomial Nonlinear State-Space and Nonlinear-Mode Models to Predict Near-Resonant Vibrations," Mechanical Systems and Signal Processing, Vol. 143, pp 106796, 2020, https://doi.org/10.1016/j.ymssp.2020.106796.

51.) Van Damme, C.I., M.S. Allen, J.J. Hollkamp, "Simultaneous Regression and Selection in Nonlinear Modal Model Identification," Vibration, (Submitted October 2020, Under Revision).

50.) Van Damme, C.I., M.S. Allen, J.J. Hollkamp, "Updating Geometrically Nonlinear Reduced Order Models using Nonlinear Modes and Harmonic Balance," AIAA Journal, 2020, http://arc.aiaa.org/doi/abs/10.2514/1.J058698).

49.) Van Damme, C.I., M.S. Allen, J.J. Hollkamp, "Evaluating Reduced Order Models of Geometrically Nonlinear Finite Element Models for Random Response Prediction using Static Equilibrium Paths," Journal of Sound and Vibration (Accepted Oct. 2019). https://doi.org/10.1016/j.jsv.2019.115018

48.) E. Jewell, M.S. Allen, S.I. Zare & M.J. Wall, "Application of Quasi-Static Modal Analysis to a Finite Element Model and Experimental Correlation," Journal of Sound and Vibration, vol. 479, 4 August 2020, 115376, https://doi.org/10.1016/j.jsv.2020.115376.

47.) J. A. Martin, D. G. Schmitz, A. C. Ehlers, M. S. Allen and D. E. Thelen, "Calibration of the Shear Wave Speed-Stress Relationship in Ex Vivo Tendons," Journal of Biomechanics, Accepted April 2019, https://doi.org/10.1016/j.jbiomech.2019.04.015

46.) R. M. Lacayo, L. Pesaresi J. Groß; D. Fochler, J. Armand, L. Salles, C. W. Schwingshackl, M. S. Allen, M. R Brake, "Nonlinear modeling of structures with bolted joints: A comparison of two approaches based on a time-domain and frequency-domain solver," Mechanical Systems and Signal Processing, vol. 114, p 413-438, 2019, https://doi.org/10.1016/j.ymssp.2018.05.033.

45.) J. R. Franz, C. A. Francis, M. S. Allen, and D. G. Thelen, "Visuomotor Entrainment and the Frequency-Dependent Response of Walking Balance to Perturbations," IEEE Transactions on Neural Systems and Rehabilitation Engineering, vol. 25, 2017.

44.) J. A. Martin, S. Brandon, E. Keuler, J. R. Hermus, A. C. Ehlers, D. J. Segalman, M. S. Allen & D. G. Thelen, "Gauging Force by Tapping Tendons," Nature Communications, vol. 9, no. 1, p. 1592, Apr. 2018,

43.) R.M. Lacayo and M. S. Allen, "A Study on the Transient Behavior of the Five-Parameter Iwan-Type Model in Ring-Up and Ring-Down Simulations," Journal of Sound and Vibration, (submitted Aug 2017).

42.) R.M. Lacayo and M. S. Allen, "Updating Structural Models Containing Nonlinear Iwan Joints Using Quasi-Static Modal Analysis," Mechanical Systems and Signal Processing, v. 118, p. 133-157, 2019, https://doi.org/10.1016/j.ymssp.2018.08.034.

41.) S. Seidlitz, R. J. Kuether, and M. S. Allen, "Experimental Approach to Compare Noise Floors of Various Torsional Vibration Sensors," Experimental Techniques, vol. 40, Issue 2, pp 661–675, 2014, http://dx.doi.org/10.1111/ext.12113.

40.) D. A. Ehrhardt, M. S. Allen, T. Beberniss, and S. A. Neild, "Finite Element Model Calibration of a Nonlinear Perforated Plate," Journal of Sound and Vibration, vol. 392, pp. 280-294, 2017.

39.) Rothberg, S.J, Allen, M.S., Castellini P., Di Maio, D., Dirckx, J.J.J., Ewins, D.J., Halkon, B.J., Muyshondt, P., Paone N., Ryan, T., Steger, H., Tomasini, E.P., Vanlanduit, S., Vignola, J.F.J., "An international review of laser Doppler vibrometry: making light work of vibration measurement," Optics and Lasers in Engineering, v 99, p 11-22, 2017, https://doi.org/10.1016/j.optlaseng.2016.10.023.

38.) J. D. Schoneman, M. S. Allen, and R. J. Kuether, "Relationships between Nonlinear Normal Modes and Response to Random Inputs," Mechanical Systems and Signal Processing, 84, p 184-199, 2017, http://dx.doi.org/10.1016/j.ymssp.2016.07.010

37.) R. Lacayo, B. Deaner, and M. S. Allen, "A Numerical Study on the Limitations of Modal Iwan Models for Impulsive Excitations," Journal of Sound and Vibration, vol. 390, pp. 118-140, 2017.

36.) R. J. Kuether, M. S. Allen, and J. J. Hollkamp, "Modal substructuring of geometrically nonlinear finite element models with interface reduction," AIAA Journal, v 55, n 5, p 1695-1706, 2017, http://dx.doi.org/10.2514/1.J055215

35.) D. R. Roettgen and M. S. Allen, "Nonlinear characterization of a bolted, industrial structure using a modal framework," Mechanical Systems and Signal Processing, vol. 84, pp. 152-170, 2017, http://dx.doi.org/10.1016/j.ymssp.2015.11.010.

34.) R. J. Kuether, M. S. Allen, and J. J. Hollkamp, "Modal Substructuring for Geometrically Nonlinear Finite Element Models," AIAA Journal, vol. 54, pp. 691-702, 2016, http://dx.doi.org/10.2514/1.J054036.

33.) D. A. Ehrhardt and M. S. Allen, "Measurement of Nonlinear Normal Modes using Multi-Harmonic Stepped Force Appropriation and Free Decay," Mechanical Systems and Signal Processing, 2016, http://dx.doi.org/10.1016/j.ymssp.2016.02.063.

32.) D. A. Ehrhardt, M. S. Allen, S. Yang, and T. Beberniss, "Full-Field Linear and Nonlinear Measurements using Continuous-Scan Laser Doppler Vibrometry and High Speed Three-Dimensional Digital Image Correlation," Mechanical Systems and Signal Processing, vol. 86, pp. 82-97, 2017, http://dx.doi.org/10.1016/j.ymssp.2015.12.003.

31.) R. J. Kuether, L. Renson, T. Detroux, C. Grappasonni, G. Kerschen, and M. S. Allen, "Nonlinear Normal Modes, Modal Interactions and Isolated Resonance Curves," Journal of Sound and Vibration, vol. 351, 2015, http://dx.doi.org/10.1016/j.jsv.2015.04.035.

30.) J. Franz, C. A. Francis, M. S. Allen, S. M. O'Connor, and D. G. Thelen, "Advanced Age Brings a Reliance on Visual Feedback to Maintain Balance During Walking," Human Movement Sciences, vol. 40, pp. 381–392, 2015. http://dx.doi.org/10.1016/j.humov.2015.01.012.

29.) R. J. Kuether, B. Deaner, M. S. Allen, and J. J. Hollkamp, "An Evaluation of Nonlinear Reduced Order Models used to Compute Nonlinear Normal Modes of Geometrically Nonlinear Structures," AIAA Journal, vol. 53, pp. 3273-3285, 2015, http://arc.aiaa.org/doi/abs/10.2514/1.J053838.

28.) B. Deaner, M. S. Allen, M. J. Starr, D. J. Segalman, and H. Sumali, "Application of Viscous and Iwan Modal Damping Models to Experimental Measurements From Bolted Structures," ASME Journal of Vibrations and Acoustics, vol. 137, p. 12, 2015, http:\\dx.doi.org\10.1115/1.4029074.

27.) H. Ardeh and M. S. Allen, " Multi-harmonic Multiple-point Collocation: An Iterative Method for Finding Periodic Orbits of Strongly Nonlinear Oscillators," Journal of Computational and Nonlinear Dynamics, vol. 11, 2016, http://dx.doi.org/10.1115/1.4031286.

26.) R. Kuether and M. S. Allen, "A Numerical Approach to Directly Compute Nonlinear Normal Modes of Geometrically Nonlinear Finite Element Models," Mechanical Systems and Signal Processing, vol. 46, pp. 1–15, 2014, http://dx.doi.org/10.1016/j.ymssp.2013.12.010.

25.) S. Yang and M. S. Allen, "Harmonic Transfer Functions to Measure Translational and Rotational Velocities with Continuous-Scan Laser Doppler Vibrometry," J. Vib. Acoust. 136(2), 021025, 2014, http://dx.doi.org/10.1115/1.4026350.

24.) S. Yang and M. S. Allen, "Lifting to Simplify Output-only Continuous Scan Laser Vibrometry," Mechanical Systems and Signal Processing, vol. 45, pp. 267–282, 2014, http://dx.doi.org/10.1016/j.ymssp.2013.11.010.

23.) D. P. Rohe and M. S. Allen, "Investigation of the Effectiveness of using an Experiment to Validate Experimental Substructure Models," Mechanical Systems and Signal Processing, vol. 43, pp. pp. 192-216, 2014, http://dx.doi.org/10.1016/j.ymssp.2013.08.026.

22.) R.L. Mayes, M.S. Allen, & D.C. Kammer, "Correcting Indefinite Mass Matrices with the Transmission Simulator Method of Substructuring," Journal of Sound and Vibration, vol. 332, pp. 5856-5866, 2013, http://dx.doi.org/10.1016/j.jsv.2013.05.025.

21.) M. W. Sracic and M. S. Allen, "Identifying parameters of multi-degree-of-freedom nonlinear structural dynamic systems using linear time periodic approximations," Mechanical Systems and Signal Processing, vol. 46, pp. 325–343, 2014, http://dx.doi.org/10.1016/j.ymssp.2014.01.014.

20.) M.S. Allen, D. C. Kammer & R. L. Mayes, "Metrics for Diagnosing Negative Mass and Stiffness when Uncoupling Experimental and Analytical Substructures," Journal of Sound and Vibration, vol. 331, p. 5435–5448, 2012. http://dx.doi.org/10.1016/j.jsv.2012.06.024

19.) S. Yang and M. S. Allen, "Output-Only Modal Analysis Using Continuous-Scan Laser Doppler Vibrometry and Application to a 20kW Wind Turbine," Mechanical Systems and Signal Processing, vol. 31, pp. 228–245, 2012, http://dx.doi.org/10.1016/j.ymssp.2012.04.012.

18.) H. Frentrup and M. S. Allen, "Error in Dynamic Spring Constant Calibration of Atomic Force Microscope Probes due to Nonuniform Cantilevers,"

Nanotechnology, vol. 22 p. 9pp, 14 June, 2011, http://dx.doi.org/10.1088/0957-4484/22/29/295703

17.) M. S. Allen, H. M. Gindlin, and R. L. Mayes, "Experimental Modal Substructuring to Estimate Fixed-Base Modes from Tests on a Flexible Fixture," Journal of Sound and Vibration, vol. 330, pp. 4413-4428, 2011, http://dx.doi.org/10.1016/j.jsv.2011.04.010

16.) M. W. Sracic and M. S. Allen, "Method for Identifying Models of Nonlinear Systems Using Linear Time Periodic Approximations," Mechanical Systems and Signal Processing, vol. 25, pp. 2705-2721, 2011, http://dx.doi.org/10.1016/j.ymssp.2011.03.004

15.) M. S. Allen, M. W. Sracic, S. Chauhan, and M. H. Hansen, "Output-Only Modal Analysis of Linear Time Periodic Systems with Application to Wind Turbine Simulation Data," Mechanical Systems and Signal Processing, vol. 25, pp. 1174-1191, 2011, http://dx.doi.org/10.1016/j.ymssp.2010.12.018

14.) S. Yang, M. W. Sracic, and M. S. Allen, "Two algorithms for mass normalizing mode shapes from impact excited continuous-scan laser Doppler vibrometry," Journal of Vibration and Acoustics, (Submitted Aug 2010, Accepted Sept. 2011). doi:10.1115/1.4005020

13.) M. S. Allen & R. L. Mayes, "Estimating the Degree of Nonlinearity in Transient Responses with Zeroed Early-Time Fast Fourier Transforms," Mechanical Systems and Signal Processing, vol. 24, pp. 2049–2064, 2010, http://dx.doi.org/10.1016/j.ymssp.2010.02.012

12.) M. S. Allen, R. L. Mayes, and E. J. Bergman, "Experimental Modal Substructuring to Couple and Uncouple Substructures with Flexible Fixtures and Multi-point Connections," Journal of Sound and Vibration, vol. 329, pp. 4891–4906, 2010, http://dx.doi.org/10.1016/j.jsv.2010.06.007.

11.) M.S. Allen & M.W. Sracic, "A New Method for Processing Impact Excited Continuous-Scan Laser Doppler Vibrometer Measurements," Mechanical Systems and Signal Processing, vol. 24, pp. 721–735, 2010, doi:10.1016/j.ymssp.2009.11.004.

10.) E. J. Bergman, M. S. Allen, D. C. Kammer, and R. L. Mayes, "Probabilistic Investigation of Sensitivities of Advanced Test-Analysis Model Correlation Methods," Journal of Sound and Vibration, vol. 329, pp. 2516–2531, 2010, http://dx.doi.org/10.1016/j.jsv.2010.01.009.

9.) M. S. Allen, H. Sumali, and P. C. Penegor, "Experimental/Analytical Evaluation of the Effect of Tip Mass on Atomic Force Microscope Calibration," ASME Journal of Dynamic Systems, Measurement and Control, vol. 131, p. 064501 (10 pp.), 2009.

8.) M. S. Allen "Frequency-Domain Identification of Linear Time-Periodic Systems using LTI Techniques," Journal of Computational and Nonlinear Dynamics, Oct. 2009, Vol. 4, 041004-1, DOI: 10.1115/1.3187151

7.) D. S. Erdahl, M. S. Allen, C. Ume and J. H. Ginsberg, "Structural Modal Analysis for Detecting Open Solder Bumps on Flip Chips," IEEE Transactions on Advanced Packaging, vol. 31, pp. 118-126, February 2008. DOI: 10.1109/TADVP.2007.914947

6.) M. S. Allen, H. Sumali & D. S. Epp, "Piecewise-linear Restoring Force Surfaces for Semi- Nonparametric Identification of Nonlinear Systems," Nonlinear Dynamics, vol. 54, no. 1-2, October, 2008. DOI 10.1007/s11071-007-9254-x

5.) M. S. Allen and T. G. Carne, "Comparison of Inverse Structural Filter (ISF) and Sum of Weighted Accelerations (SWAT) Time Domain Force Identification Methods,"

Mechanical Systems and Signal Processing, vol. 22, pp. 1036–1054, 2008. http://dx.doi.org/10.2514/6.2006-1885

4.) M. S. Allen, J. E. Massad, R. V. Field, Jr. and C. W. Dyck, "Input and Design Optimization Under Uncertainty to Minimize Impact Velocity of an Electrostatically-Actuated MEMS Switch," Journal of Vibration and Acoustics, vol. 130, p. 021009, 2008. doi:10.1115/1.2827981

3.) M. S. Allen and J. H. Ginsberg, "A Global, Single-Input-Multi-Output (SIMO) Implementation of the Algorithm of Mode Isolation and Applications to Analytical and Experimental Data," Mechanical Systems and Signal Processing, vol 20, 2006, pp. 1090-1111. http://dx.doi.org/10.1016/j.ymssp.2005.09.007

2.) J. H. Ginsberg and M. S. Allen, "A Linear Least-Squares Version of the Algorithm of Mode Isolation for Identifying Modal Properties, Part I: Conceptual Development," Journal of the Acoustical Society of America, vol. 116, no. 2, August 2004, pp. 900-907. http://dx.doi.org/10.1121/1.1765195

1.) M. S. Allen and J. H. Ginsberg, "A Linear Least-Squares Version of the Algorithm of Mode Isolation for Identifying Modal Properties, Part II: Application and Assessment," Journal of the Acoustical Society of America, vol. 116, no. 2, August 2004, pp. 908-915. http://dx.doi.org/10.1121/1.1765196

Refereed Conference Papers

- A. Singh, M.S. Allen & R. J. Kuether, "Substructure Interface Reduction Techniques to Capture Nonlinearities in Bolted Structures," ASME IDETC Conference, August 2020, https://doi.org/10.1115/DETC2020-22417A
- C. I. VanDamme & M.S. Allen, "Using Nonlinear Normal Modes to Optimize the Design of Geometrically Nonlinear Structures," AIAA Sci-Tech: 60th AIAA Structures, Structural Dynamics and Materials Conference, Orlando, Florida, 2019.
- C. I. Van Damme, A. E. Madrid & M. S. Allen, "Using the Harmonic Balance Method to Directly Compute NNMs of Geometrically Nonlinear Finite Element Models," ISMA-USD Noise and Vibration Engineering Conference 2018, Leuven, Belgium, Sept. 17-19, 2019.
- I. Zare & M. S. Allen, "A Block-Gauss Seidel Algorithm with Static Reduction to Predict Damping in Bolted Joints," ISMA-USD Noise and Vibration Engineering Conference 2018, Leuven, Belgium, Sept. 17-19, 2019.
- C. I. VanDamme, M.S. Allen & J. J. Hollkamp, "Nonlinear Structural Model Updating Based Upon Nonlinear Normal Modes," AIAA Sci-Tech: 59th AIAA Structures, Structural Dynamics and Materials Conference, Orlando, Florida, 2018.
- J. Schoneman, C. Ostoich, L. Jarman, C. I. Van Damme and M. S. Allen "Linear and Nonlinear Reduced-Order Modeling for Hypersonic Panel Flutter," AIAA Sci-Tech: 59th AIAA Structures, Structural Dynamics and Materials Conference, Orlando, Florida, 2018.
- E. Jewell, M. S. Allen, and R. Lacayo, "Predicting damping of a cantilever beam with a bolted joint using quasi-static modal analysis," in Proceedings of the ASME 2017 International Design Engineering Technical Conference & 13th International Conference on Multibody Systems, Nonlinear Dynamics, and Control IDETC/ MSNDC 2017 Cleveland, OH, USA, 2017

- J. Franz, C. Francis, M. S. Allen, and D. G. Thelen, "Visuomotor entrainment and the control of balance in walking," in IEEE 2016 Biomechanics and Neural Control of Movement (BANCOM) Conference Sterling, OH 2016
- S. J. Kelly, M. S. Allen, and H. A. Ardeh, "Multi-Point Multi-Harmonic Collocation With Continuation To Compute Branches Of Nonlinear Modes Of Structural Systems," in ASME 2015 International Design Engineering Technical Conference Boston, MA, 2015
- D. J. Segalman, M. S. Allen, M. Eriten, and K. Hoppmann, "Experimental Assessment of Joint-Like Modal Models for Structures," in ASME 2015 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2015 Boston, MA, 2015
- M. S. Allen and B. Weekes, "Nonlinear Model Updating of a Flat Plate and a Stiffened Skin Panel from a Lynx Helicopter," in Scitech 2015, 56th AIAA Structures, Structural Dynamics and Materials Conference Kissimmee, Florida, 2015.
- D. A. Ehrhardt, R. J. Kuether, and M. S. Allen, "Nonlinear Normal Modes in Finite Element Model Validation of Geometrically Nonlinear Flat and Curved Beams," in Scitech 2015, 56th AIAA Structures, Structural Dynamics and Materials Confernece Kissimmee, Florida, 2015.
- J. D. Schoneman, M. S. Allen, and R. J. Kuether, "Relationships between Nonlinear Normal Modes and Response to Random Inputs," presented at the 5th AIAA/ASME/ASCE/AHS/SC Structures, Structural Dynamics, and Materials Conference, National Harbor, Maryland, 2014.
- R. J. Kuether and M. S. Allen, "Substructuring with Nonlinear Reduced Order Models and Interface Reduction with Characteristic Constraint Modes," presented at the 55th AIAA/ASME/ASCE/AHS/SC Structures, Structural Dynamics, and Materials Conference, National Harbor, Maryland, 2014.
- B. Deaner, M. S. Allen, M. J. Starr, and D. J. Segalman, "Application of Viscous and Iwan Modal Damping Models to Experimental Measurements from Bolted Structures," presented at the ASME 2013 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference IDETC/CIE 2013, Portland, Oregon, USA, 2013.
- M. S. Allen, R. J. Kuether, B. Deaner & M. W. Sracic, "A Numerical Continuation Method to Compute Nonlinear Normal Modes Using Modal Reduction," 53rd AIAA Structures, Structural Dynamics, and Materials Conference, Honolulu, Hawaii, April 23-26, 2012.
- S. Yang & M. S. Allen, "A Lifting Algorithm for Output-only Continuous Scan Laser Doppler Vibrometry," 53rd AIAA Structures, Structural Dynamics, and Materials Conference, Honolulu, Hawaii, April 23-26, 2012.
- M. S. Allen & M. W. Sracic, "System Identification of Dynamic Systems with Cubic Nonlinearities Using Linear Time-Periodic Approximations," ASME 2009 International Design Engineering Technical Conference IDETC, San Diego, California, Aug. 30-Sept. 2, 2009.
- M. S. Allen & D. M. Aguilar, "Model Validation of a Bolted Beam Using Spatially Detailed Mode Shapes Measured by Continuous-Scan Laser Doppler Vibrometry," 50th AIAA Structures, Structural Dynamics, and Materials Conference, Palm Springs, California, May 4-7, 2009.

- M. S. Allen & J. A. Camberos, "Comparison of Uncertainty Propagation / Response Surface Techniques for Two Aeroelastic Systems," 50th AIAA Structures, Structural Dynamics, and Materials Conference, Palm Springs, California, May 4-7, 2009.
- E. J. Bergman, M. S. Allen, and R. L. Mayes, "Sensitivity of Two Component Mode Synthesis Methods Applied to Addition and Subtraction of Substructures," in 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference Schaumberg, IL, 2008.
- M. S. Allen, "Floquet Experimental Modal Analysis for System Identification of Linear Time-Periodic Systems," ASME 2007 International Design Engineering Technical Conferences, IDETC/CIE 2007, Las Vegas, Nevada, USA, Sept. 4-7, 2007.
- M. S. Allen, H.. Sumali & D. S. Epp, "Restoring Force Surface Analysis of Nonlinear Vibration data from Micro-Cantilever Beams," presented at 2006 ASME Congress in Chicago, IL, November 2006.
- M. S. Allen, J. E. Massad, and R. V. Field, Jr. "Modeling and input optimization under uncertainty for a collection of RF MEMS devices," presented at 2006 ASME Congress in Chicago, IL, November 2006.
- M. S. Allen and T. G. Carne, "Comparison of Inverse Structural Filter (ISF) and Sum of Weighted Accelerations (SWAT) Time Domain Force Identification Methods," presented at the 47th AIAA-ASME-ASCE-AHS-ASC Structures, Structural Dynamics, and Materials Conference, Newport, Rhode Island, May 2006.

Submitted Conference Papers

- Mitchell P.J. Wall, M. S. Allen, R. J. Kuether, "Nonlinear Variability due to Mode Coupling in a Bolted Benchmark Structure," 39th International Modal Analysis Conference (IMAC XXXIX), Orlando, Florida / Virtual, February 1-11, 2021.
- M. J. Tuman, C. A. Schumann, M. S. Allen, W. J. DeLima, E. Dodgen, "Investigation of Transmission Simulator Based Response Reconstruction Accuracy," 39th International Modal Analysis Conference (IMAC XXXIX), Virtual, February 1-11, 2021.
- A. Singh, K. Wielgus, D. Ignazio, R. J. Kuether, M. S. Allen, "Nonlinear Dynamic Analysis of a Shape Changing Finger-like Mechanism for Morphing Wings," 39th International Modal Analysis Conference (IMAC XXXIX), Orlando, Florida / Virtual, February 1-11, 2021.
- A. Singh, M. S. Allen, R. J. Kuether, "Multi-mode Quasi-static Excitation for Systems with Nonlinear Joints," 39th International Modal Analysis Conference (IMAC XXXIX), Orlando, Florida / Virtual, February 1-11, 2021.
- M. Kwarta & M. S. Allen, "NIXO Based Identification of the Dominant Terms in a Nonlinear Equation of Motion," 39th International Modal Analysis Conference (IMAC XXXIX), Virtual, February 1-11, 2021.
- Drithi Shetty & M. S. Allen, "A General Iwan Element Derived from Quasi-Static Force-Displacement Data," 39th International Modal Analysis Conference (IMAC XXXIX), Virtual, February 1-11, 2021.
- Benjamin Moldenhauer, Aabhas Singh, M. S. Allen, D. Roettgen & R. J. Kuether, "Extensions to a method for characterizing instantaneous frequency and damping of nonlinear systems," 39th International Modal Analysis Conference (IMAC XXXIX), Virtual, February 1-11, 2021.

- Kyusic Park & M. S. Allen, "Model Updating and Uncertainty Quantification of Geometrically Nonlinear Panel subjected to Non-uniform Temperature Fields," 39th International Modal Analysis Conference (IMAC XXXIX), Virtual, February 1-11, 2021.
- Benjamin Moldenhauer, M. S. Allen & D. Roettgen, "Variation of the restoring force surface method to estimate nonlinear stiffness and damping parameters," International Seminar on Modal Analysis (ISMA), Leuven, Belgium / Virtual, 2020.
- A. Singh, M. S. Allen, R. J. Kuether, "Substructure Interface Reduction with Iwan Elements to Capture Nonlinearity," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- K. Park, M. S. Allen, "Nonlinear Normal Modes of Geometrically Nonlinear Structures using Quasi-static Modal Analysis," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- K. Park, M. S. Allen, "Tuning of Finite Element Model Parameters to Match Nonlinear Reduced Order Models," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- B. Moldenhauer, M. S. Allen, D. Roettgen, B. Owens, "Implementing Experimental Substructuring in Abaqus," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- M. Wall, I. Zare, M. S. Allen, "Model Correlation to a Nonlinear Bolted Structure Using Quasi-Static Modal Analysis," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- D. Shetty, M. S. Allen, J. D. Schoneman, "Application of the Bouc-Wen model to Bolted Joint Dynamics," in 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- M. S. Allen, J. D. Schoneman, W. Scott & J. Sills "Application of Quasi-Static Modal Analysis to an Orion Multi-Purpose Crew Vehicle Test," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- G. James, R. Grady, M. S. Allen, and E. Bruno, "Forcing Function Estimation for Space System Rollout," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- C. I. Van Damme & M. S. Allen, "Nonlinear Normal Modes of Geometrically Nonlinear Finite Element Models about Thermal Equilibrium States," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- R. M. Lacayo & M.S. Allen, "Towards an Understanding of the Transient Behavior of the Five-Parameter Iwan-Type Model," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- M. Kwarta, M. S. Allen, J. J. Hollkamp, "Extensions to NIFO and CRP to Estimate Frequency-Independent Nonlinear Parameters," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- M. Kwarta, M. S. Allen, J. J. Hollkamp, "Nonlinear Normal Mode Estimation with Near-Resonant Steady State Inputs," in 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.

- B. Moldenhauer, A. Singh, P. Thoenen, D. R. Roettgen, B. Pacini, R. J. Kuether, and M. S. Allen, "Influences of Modal Coupling on Experimentally Extracted Nonlinear Models," in 37th International Modal Analysis Conference (IMAC XXXVII), Orlando, FL, United States, 2019.
- B. Moldenhauer, M. S. Allen, W. J. Delima, and E. Dodgen, "Using Hybrid Modal Substructuring with a Complex Transmission Simulator to Model an Electrodynamic Shaker," in 37th International Modal Analysis Conference (IMAC XXXVII), Orlando, FL, United States, 2019.
- A. Singh, M. S. Allen, and W. J. Delima, "Combining Electromagnetic Shakers and Piezoelectric Actuators for Control of High Frequency Random Vibration," in 37th International Modal Analysis Conference (IMAC XXXVII), Orlando, FL, United States, 2019.
- M. Kwarta, M. S. Allen, and J. J. Hollkamp, " An Interpolation Algorithm to Speed up Nonlinear Modal Testing using Force Appropriation," in 37th International Modal Analysis Conference (IMAC XXXVII), Orlando, FL, United States, 2019.
- A. Singh, M. Wall, M. S. Allen, and R. J. Kuether, "Spider Configurations for Models with Discrete Iwan Elements," in 37th International Modal Analysis Conference (IMAC XXXVII), Orlando, FL, United States, 2019.
- D. Shetty and M. S. Allen, " A New Iwan / Palmov Implementation for Fast Simulation and System Identification," in 37th International Modal Analysis Conference (IMAC XXXVII), Orlando, FL, United States, 2019.
- C. I. Van Damme, A. E. Madrid, M. S. Allen and J. J. Hollkamp, " Simultaneous Regression and Selection in Nonlinear Modal Model Identification," in 37th International Modal Analysis Conference (IMAC XXXVI), Orlando, FL, United states, 2019.
- C. I. Van Damme, M. Kwarta, M. S. Allen and J. J. Hollkamp, "Nonlinear Model Updating Applied to Reduced Order Models of Curved Beams," in 37th International Modal Analysis Conference (IMAC XXXVI), Orlando, FL, United states, 2019.
- M. S. Allen and J. W. Sills, "Historical Review of 'Building Block Approach' in Validation for Human Space Flight," in 37th International Modal Analysis Conference (IMAC XXXVI), Orlando, FL, United states, 2019.
- M. Wall, M. S. Allen, and I. Zare, "Predicting S4 Beam Joint Nonlinearity using Quasi-Static Modal Analysis," in 37th International Modal Analysis Conference (IMAC XXXVII), Orlando, FL, United states, 2019.
- M. S. Allen and R. L. Mayes, "Recent Advances to Estimation of Fixed-Interface Modal Models using Dynamic Substructuring," in 36th International Modal Analysis Conference (IMAC XXXVI) Orlando, Florida, 2018.
- D. Piombino, M. S. Allen, "System Identification to Estimate the Nonlinear Modes of a Gong," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida 2018.
- I. Zare, M. S. Allen & E. J. Jewell, "An Enhanced Static Reduction Algorithm for Predictive Modeling of Bolted Joints," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, 2018. (Extended Abstract)
- A. H. Haslam, G. Chauda, N. Kenia, E. S. Rufät-Meix, M. S. Allen, R. M. Lacayo, M. Krack & M. R. W. Brake, "Non-linear system identification in the presence of modal

coupling," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, 2018.

- B. Moldenhauer, M. S. Allen, W. de Lima, E. Dodgen, "Modeling an Electrodynamic Shaker using Experimental Substructuring," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, 2018.
- A. Singh, M. S. Allen, W. J. DeLima, "Multi–Input Multi–Output Active Vibration Control for High Frequency Random Vibration," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, 2018.
- P. Hughes, W. Scott,W. Wu, R. J. Kuether, M. S. Allen, P. Tiso "Hurty/Craig-Bampton Models with Interface Reduction for Mechanical Joints," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, 2018.
- A. Singh, M. Scapolan, Y. Saito, M. S. Allen, D. Roettgen, B. Pacini, R. J. Kuether, "Experimental Characterization of a new Benchmark Structure for Prediction of Damping Nonlinearity," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, 2018.
- C. I. VanDamme, B. Moldenhauer, M. S. Allen & J. J. Hollkamp, "Computing Nonlinear Normal Modes of Aerospace Structures using the Multi-Harmonic Balance Method," in 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, 2018.
- L. M. Jarman, C. VanDamme, and M. S. Allen, "Nonlinear Dynamic Analysis of a Thermally Buckled Aircraft Panel Using NNMs," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- R.M. Lacayo, L. Pesaresi, D. Fochler, J. Gross, J. Armand, L. Salles, M. R. W. Brake, and C.W. Schwingshackl, "A Comparison of Numerical Approaches for Predicting the Dynamics of a Beam with a Lap Joint," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- C. I. VanDamme & M. S. Allen, " Nonlinear Normal Modes of a Curved Beam and its Response to Random Loading," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- D. Roettgen, M. S. Allen, D. C. Kammer, and R. L. Mayes, " Substructuring of a nonlinear beam using a modal Iwan framework, Part I: Nonlinear Modal Model Identification," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- D. Roettgen, M. S. Allen, D. C. Kammer, and R. L. Mayes, " Substructuring of a nonlinear beam using a modal Iwan framework, Part II: Nonlinear Modal Substructuring," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- S.B. Cooper, M. Rosatello, A.T. Mathis, K. Johnson, M.R.W. Brake, M.S. Allen, A.A. Ferri, D.R. Roettgen, B.R. Pacini, R.L. Mayes, "Effect of Far-Field Structure on Joint Properties," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- L. Wu, D. Krattiger, M. Zacharczuk, M. Buck, R. J. Kuether, M. S. Allen, M. R. W. Brake, P. Tiso, "Evaluation of Interface Reduction Methods for Craig Bampton Models," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.

- D. A. Ehrhardt, M. S. Allen & T. Beberniss, " The Measurement of Nonlinear Resonant Decay using Continuous-scan Laser Doppler Vibrometry," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- J. D. Schoneman, M. S. Allen, R. J. Kuether, "Nonlinear Modal Substructuring of Panel and Stiffener Assemblies via Characteristic Constraint Modes," in 35th International Modal Analysis Conference (IMAC XXXV), Garden Grove, California, 2017.
- M. S. Allen, R. Lacayo, and M. R. W. Brake, "Quasi-static Modal Analysis based on Implicit Condensation for Structures with Nonlinear Joints," in International Seminar on Modal Analysis (ISMA) Leuven, Belgium, 2016.
- M. S. Allen, D. R. Roettgen, D. C. Kammer, and R. L. Mayes, "Experimental Modal Substructuring with Nonlinear Modal Iwan Models to Capture Nonlinear Subcomponent Damping," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- D. A. Ehrhardt and M. S. Allen, "Nonlinear Reduced Order Modeling of a Curved Axi-symmetric Perforated Plate: Comparison with Experiments," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- D. R. Roettgen, B. Seeger, W. C. Tai, S. Baek, T. Dossogne, M. S. Allen, R. J. Kuether, M. R. Brake, and R. L. Mayes, "A Comparison of Reduced Order Modeling Techniques Used in Dynamic Substructuring," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- J. D. Schoneman and M. S. Allen, "Investigating Nonlinear Modal Energy Transfer in a Random Load Environment," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- J. D. Schoneman and M. S. Allen, "Modal Test and Parameter Updating of Metal Laser Sintered Components," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- M. Stender, A. Papangelo, M. S. Allen, M. R. Brake, C. W. Schwingshackl, and M. Tiedemann, "Structural Design with Joints for Maximum Dissipation," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- D. Tcherniak and M. S. Allen, "Experimental dynamic characterization of operating wind turbines with anisotropic rotor," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- C. I. VanDamme and M. S. Allen, "Using NNMs to Evaluate Reduced Order Models of Curved Beam," in 34th International Modal Analysis Conference (IMAC XXXIV) Orlando, Florida, 2016.
- L. C. M. Guerin, R. J. Kuether, and M. S. Allen, "Considerations for Indirect Parameter Estimation in Nonlinear Reduced Order Models," in 33rd International Modal Analysis Conference (IMAC XXXIII) Orlando, Florida, 2015.
- R. J. Kuether and M. S. Allen, "Validation of Nonlinear Reduced Order Models with Time Integration Targeted at Nonlinear Normal Modes," in 33rd International Modal Analysis Conference (IMAC XXXIII) Orlando, Florida, 2015.
- D. R. Roettgen and M. S. Allen, "Experimental Dynamic Substructuring of a Catalytic Converter System using the Transmission Simulator Method," in 33rd International Modal Analysis Conference (IMAC XXXIII) Orlando, Florida, 2015.

- D. A. Ehrhardt, S. Yang, T. Beberniss, and M. S. Allen, "Linear and Nonlinear Response of a Flat Rectangular Plate Measured with Continuous-Scan Laser Doppler Vibrometry and 3D-Digital Image Correlation," in 33rd International Modal Analysis Conference (IMAC XXXIII) Orlando, Florida, 2015.
- D. A. Ehrhardt and M. S. Allen, "Measurement of Nonlinear Normal Modes Using Mono-harmonic Force Appropriation: Experimental Investigation " in 33rd International Modal Analysis Conference (IMAC XXXIII) Orlando, Florida, 2015.
- M. S. Allen, J. B. Blecke, and D. R. Roettgen, "A Wiki for Sharing Substructuring Methods, Measurements and Information," presented at the 32nd International Modal Analysis Conference (IMAC XXXII), Orlando, Florida, 2014.
- R. J. Kuether, M. R. Brake, and M. S. Allen, "Evaluating Convergence of Reduced Order Models Using Nonlinear Normal Modes," presented at the 32nd International Modal Analysis Conference (IMAC XXXII), Orlando, Florida, 2014.
- R. J. Kuether and M. S. Allen, "Craig-Bampton Substructuring for Geometrically Nonlinear Subcomponents," presented at the 32nd International Modal Analysis Conference (IMAC XXXII), Orlando, Florida, 2014.
- D. A. Ehrhardt, R. A. Harris, and M. S. Allen, "Numerical and Experimental Determination of Nonlinear Normal Modes of a Circular Perforated Plate," presented at the 32nd International Modal Analysis Conference (IMAC XXXII), Orlando, Florida, 2014.
- D. A. Ehrhardt, S. Yang, T. J. Beberniss, and M. S. Allen, "Mode Shape Comparison Using Continuous-scan Laser Doppler Vibrometry and High Speed 3D Digital Image Correlation," presented at the 32nd International Modal Analysis Conference (IMAC XXXII), Orlando, Florida, 2014.
- M. S. Allen, D. C. Kammer, and R. L. Mayes, "Experimental Based Substructuring Using a Craig-Bampton Transmission Simulator Model," presented at the 32nd International Modal Analysis Conference (IMAC XXXII), Orlando, Florida, 2014.
- S. Yang, D. Tcherniak, and M. S. Allen, "Modal Analysis of Rotating Wind Turbine using Multiblade Coordinate Transformation and Harmonic Power Spectrum," presented at the 32nd International Modal Analysis Conference, Orlando, Florida, 2014.
- B. Deaner, M. S. Allen, M. J. Starr, and D. J. Segalman, "Investigation of Modal Iwan Models for Structures with Bolted Joints," presented at the 31st International Modal Analysis Conference (IMAC XXXI), Garden Grove, CA, 2013.
- R. J. Kuether and M. S. Allen, "Structural Modification of Nonlinear FEA Subcomponents Using Nonlinear Normal Modes," presented at the 31st International Modal Analysis Conference (IMAC XXXI), Garden Grove, CA, 2013.
- S. Yang and M. S. Allen, "Transfer Functions to Measure Translational and Rotational Velocities with Continuous-Scan Laser Doppler Vibrometry," presented at the 31st International Modal Analysis Conference (IMAC XXXI), Garden Grove, CA, 2013.
- H. A. Ardeh and M. S. Allen, "Investigating Cases of Jump Phenomenon in a Nonlinear Oscillatory System," presented at the 31st International Modal Analysis Conference (IMAC XXXI), Garden Grove, CA, 2013.

- M. S. Allen, "Exploring Experimental Structural Dynamics in EMA/ME 540 at UW-Madison," presented at the 31st International Modal Analysis Conference (IMAC XXXI), Garden Grove, 2013.
- M. W. Sracic, M. S. Allen, and H. Sumali, "Identifying the modal properties of nonlinear structures using measured free response time histories from a scanning laser Doppler vibrometer," in 30th International Modal Analysis Conference Jacksonville, Florida, 2012.
- M. W. Sracic, S. Yang, and M. S. Allen, "Comparing Measured and Computed Nonlinear Frequency Responses to Calibrate Nonlinear System Models," in 30th International Modal Analysis Conference Jacksonville, Florida, 2012.
- M. S. Allen and R. J. Kuether, "Substructuring with Nonlinear Subcomponents: A Nonlinear Normal Mode Perspective," in 30th International Modal Analysis Conference Jacksonville, Forida, 2012.
- M. S. Allen and D. C. Kammer, "Simple Experiments to Validate Modal Substructure Models," in 30th International Modal Analysis Conference Jacksonville, Florida, 2012.
- S. Seidlitz, R. J. Kuether, and M. S. Allen, "Comparison of Noise Floors of Various Torsional Vibration Sensors," in 30th International Modal Analysis Conference Jacksonville, Florida, 2012.
- R. L. Mayes, M. S. Allen, and D. C. Kammer, "Eliminating Indefinite Mass Matrices with the Transmission Simulator Method of Substructuring," in 30th International Modal Analysis Conference Jacksonville, Florida, 2012.
- R. L. Mayes and M. S. Allen, "Converting a Driven Base Vibration Test to a Fixed Base Modal Analysis " in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. W. Sracic and M. S. Allen, "Identifying parameters of nonlinear structural dynamic systems using linear time-periodic approximations," in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. W. Sracic and M. S. Allen, "Numerical Continuation of Periodic Orbits for Harmonically Forced Nonlinear Systems" in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- S. Yang and M. S. Allen, "Output-Only Modal Analysis Using Continuous-Scan Laser Doppler Vibrometry and Application to a 20kW Wind Turbine," 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. S. Allen, S. Chauhan, and M. H. Hansen, "Advanced Operational Modal Analysis Methods for Linear Time Periodic System Identification," in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. S. Allen, D. C. Kammer, and R. L. Mayes, "Metrics for Diagnosing Negative Mass and Stiffness when Uncoupling Experimental and Analytical Substructures," in 29th International Modal Analysis Conference (IMAC XXIX) Jacksonville, Florida, 2011.
- M. S. Allen, D. C. Kammer, and R. L. Mayes, "Uncertainty in Experimental / Analytical Substructuring Predictions: A Review with Illustrative Examples," International Seminar on Modal Analysis (ISMA), Leuven, Belgium, Sept. 20-22, 2010.
- A. Gasparoni, M. S. Allen, S. Yang, M. W. Sracic, P. Castellini & E. P. Tomasini, "Experimental Modal Analysis on a Rotating Fan Using Tracking-CSLDV," in 9th

International Conference on Vibration Measurements by Laser Techniques, Ancona, Italy, 2010.

- M. S. Allen, H. M. Gindlin & R. L. Mayes, "Experimental Modal Substructuring to Extract Fixed-Base Modes from a Substructure Attached to a Flexible Fixture," 28th International Modal Analysis Conference (IMAC XXVIII), Jacksonville, Florida, Feb. 1-4, 2010.
- H. Frentrup & M. S. Allen, "Error quantification in calibration of AFM probes due to non-uniform cantilevers," 28th International Modal Analysis Conference (IMAC XXVIII), Jacksonville, Florida, Feb. 1-4, 2010.
- M. S. Allen, M. W. Sracic, S. Chauhan & M. H. Morten, "Output-Only Modal Analysis of Linear Time Periodic Systems with Application to Wind Turbine Simulation Data," 28th International Modal Analysis Conference (IMAC XXVIII), Jacksonville, Florida, Feb. 1-4, 2010.
- M. S. Allen, H. Sumali, and P. C. Penegor, "Effect of Tip Mass on Atomic Force Microscope Calibration by Thermal Tune Method," in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. W. Sracic & M. S. Allen, "Experimental Investigation of the Effect of Speckle Noise on Continuous Scan Laser Doppler Vibrometer Measurements," in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. S. Allen & R. L. Mayes, "Estimating the Degree of Nonlinearity in Transient Responses with Zeroed Early-time Fast Fourier Transforms," in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. S. Allen & S. A. Miller, "Effect of Model Order Ambiguity in Experimental Modal Analysis on Substructuring Predictions," in 27th International Modal Analysis Conference (IMAC XXVII), Orlando, Florida, Feb. 2009.
- M. S. Allen and M. W. Sracic, "Mass Normalized Mode Shapes Using Impact Excitation and Continuous-Scan Laser Doppler Vibrometry," in 8th International Conference on Vibration Measurements by Laser Techniques, Ancona, Italy, 2008, pp. 7098-3.
- M. S. Allen & M. W. Sracic, "A Method for Generating Pseudo Single-Point FRFs from Continuous Scan Laser Vibrometer Measurements," 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.
- E. J. Bergman, M. S. Allen, D. C. Kammer & R. L. Mayes, "Probabilistic Investigation of Sensitivities of Advanced Test-Analysis Model Correlation Methods," 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.
- M. S. Allen, H. Sumali & E. B. Locke, "Experimental/Analytical Evaluation of the Effect of Tip Mass on Atomic Force Microscope Calibration," 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.
- R. L. Mayes, P. S. Hunter, T. W. Simmermacher & M. S. Allen, "Combining Experimental and Analytical Substructures with Multiple Connections," 26th International Modal Analysis Conference (IMAC XXVI), Orlando, Florida, Feb. 2008.

- M. S. Allen & R. L. Mayes, "Comparison of FRF and Modal Methods for Combining Experimental and Analytical Substructures," 25th International Modal Analysis Conference (IMAC XXV), Orlando, Florida, Feb. 2007.
- M. S. Allen and J. H. Ginsberg, "Floquet Modal Analysis to Detect Cracks in a Rotating Shaft on Anisotropic Supports," 24th International Modal Analysis Conference (IMAC XXIV), St. Louis Missouri, Feb. 2006.
- M. S. Allen and J. H. Ginsberg, "Global, Hybrid, MIMO Implementation of the Algorithm of Mode Isolation," 23rd International Modal Analysis Conference (IMAC XXIII), Orlando, Florida, 2005.
- M. S. Allen, J. H. Ginsberg, and A. Ferri, "Modal Identification of the Z24 Bridge Using MIMO-AMI," 23rd International Modal Analysis Conference (IMAC XXIII), Orlando, Florida, 2005.
- M. S. Allen and J. H. Ginsberg, "SIMO Extension of the Algorithm of Mode Isolation," presented at the 22nd International Modal Analysis Conference (IMAC XXII), Dearborn, Michigan, 2004.
- J. H. Ginsberg and M. S. Allen, "Recent Improvements of the Algorithm of Mode Isolation," presented at Proceedings of IMECE'03, ASME International Mechanical Engineering Congress and Exposition, NCA, Washington, DC, 2003.
- M. S. Allen, C. Moloney, J. H. Ginsberg, and A. Ferri, "Comparison of a Linear Least Squares Algorithm and STAR Modal for a Square Elastic Plate," presented at the 21st International Modal Analysis Conference (IMAC XXI), Orlando, Florida, 2003.
- J. H. Ginsberg, M. S. Allen, A. Ferri, and C. Moloney, "A General Linear Least Squares SDOF Algorithm for Identifying Eigenvalues and Residues," presented at the 21st International Modal Analysis Conference (IMAC XXI), Orlando, Florida, 2003.
- W. F. Pratt, S. Sommerfeldt and M. Allen, "Testing Wavy Composites," Science of Advanced Materials and Process Engineering Series, 45, Book 1, 216-228, 2001.
- W. F. Pratt, M. Allen and C. G. Jensen, "Designing with Wavy Composites," Science of Advanced Materials and Process Engineering Series, 45, Book 1, 203-215, 2001.
- W. F. Pratt and M. S. Allen, "Characterization and Finite Element Model Correlation of Wavy Composites," 33rd International SAMPE Technical Conference, Seattle, WA, 2001.
- W. F. Pratt and M. S. Allen, "Testing and Characterization of Highly Damped Structural Materials," 33rd International SAMPE Technical Conference, Seattle, WA, (2001).

AFRL Final Reports

- M.S. Allen, C. I. Van Damme, M. Kwarta, "Testing and Model Updating for Geometrically Nonlinear Hypersonic Vehicle Assemblies using Nonlinear Normal Modes," Contract # FA9550-17-1-0009, Air Force Office of Scientific Research, 2020.
- M.S. Allen, R. J. Kuether & J.D. Schoneman, "(YIP11) Substructuring with Nonlinear Subcomponent Models Based on Nonlinear Normal Modes with Application to Hypersonic Vehicle Design," Contract # FA9550-11-1-0035, Air Force Office of Scientific Research, 2014.
- W. F. Pratt, M. S. Allen and T. J. Skousen, "Highly Damped Lightweight Wavy Composites," AFRL-VS-TR-2001, Phillips Air Force Research Laboratory, Kirkland AFB, NM, 2001.

Invited Presentations

- "System Identification and Quasi-static Modeling for Structures with Bolted Joints: Current Status and Future Directions," 8th International Conference On Nonlinear Vibrations, Localization and Energy Transfer, Ascona, Switzerland, July 6-9, 2021.
- "Analysis, Design and Model Updating of Geometrically Nonlinear Finite Element Models using Nonlinear Normal Modes," Mechanical Engineering Department, Brigham Young University, Jan 15, 2020.
- "Interfacing Measurements and Modeling for Nonlinear Systems: Current Challenges and Opportunities," Seminar at Imperial College, London, UK, Jan. 13, 2020.
- "Interfacing Measurements and Modeling for Nonlinear Systems: Current Challenges and Opportunities," DigiTwin Quarterly Meeting, Brisol, UK, Jan. 8, 2020.
- "Modern Challenges in Structural Dynamics and Recent Advances," Seminar at Brigham Young University, Nov. 19, 2018.
- "Structural Dynamics Challenges in Launch: How can we get things to space without shaking them apart?" Invited Seminar at the UW-Madison Space Place, Dec. 12, 2017. (Recorded for rebroadcast on Wisconsin Public Television).
- "Challenges in Modeling Friction and Contact at Interfaces in Structural Dynamics," Mechanics Seminar Series, UW-Madison, Oct. 27, 2017
- "Overview of Modeling and Test Methods for Nonlinearity due to Friction at Interfaces," Invited Seminar at Penn State University, Oct. 13, 2017.
- "Challenges in Modeling Friction and Contact at Interfaces in Structural Dynamics," Engineering Mechanics Seminar, Oct. 2017.
- "Nonlinear Normal Modes: A Unifying Concept to Understand and Design Nonlinear Dynamic Systems," Invited seminar, Chaos Seminar Series, UW-Madison, Sept. 19, 2017.
- "Nonlinear Normal Modes: A Unifying Concept to Understand and Design Nonlinear Dynamic Systems," Invited Tutorial Lecture Air Force Research Laboratory, Dayton, OH, Aug. 10, 2017.
- "An Introduction to Interface Modeling and Reduction in Structural Dynamics," Sandia National Laboratories, NOMAD Institute, June 2017
- "Nonlinear Normal Modes: A Unifying Concept to Understand and Design Nonlinear Dynamic Systems," Invited Tutorial Lecture for NASA Engineering & Safety Center, Loads and Dynamics Technical Discipline Team, April 10, 2017.
- "Analysis, Design and Model Updating of Geometrically Nonlinear Finite Element Models using Nonlinear Normal Modes," Aerospace Engineering Department, University of Michigan, Sept. 15, 2016.
- "How are Nonlinear Normal Modes Useful for Structural Dynamic Design/Analysis?," Invited Tutorial Lecture at the 6th International Conference on Nonlinear Vibrations, Localization and Energy Transfer, Liege, Belgium, July 5, 2016
- "Advances in Experimental-Analytical Substructuring and Extensions for Nonlinear Systems," Invited Seminar at ATA Engineering, San Diego, CA, June 10, 2016.
- "Numerical Computation of Nonlinear Normal Modes for Geometrically Nonlinear Finite Element Models with Application to Substructuring and Model Validation," Ohio State University, Oct. 3, 2014.

- "Modeling the Nonlinear Damping of Jointed Structures using Iwan Models: Discrete & Modal ," Sandia National Laboratories, Joints Institute, July 2014.
- "Numerical Computation of Nonlinear Normal Modes for Geometrically Nonlinear Finite Element Models with Application to Substructuring and Model Validation," Imperial College, London, May 28, 2014.
- "Numerical Computation of Nonlinear Normal Modes for Geometrically Nonlinear Finite Element Models with Application to Substructuring and Model Validation," University of Sheffield, May 21, 2014.
- "Numerical Computation of Nonlinear Normal Modes for Geometrically Nonlinear Finite Element Models with Application to Substructuring and Model Validation," University of Bristol, May 14, 2014.
- "An Overview of Substructuring Research at the University of Wisconsin," Lindberg Lecture Series, Mechanical Engineering Department, University of Wisconsin-Madison, March, 2013.
- "Response Prediction for Structural Dynamic Systems with Experimental-Analytical Substructuring," Engineering Physics Department Colloquium, University of Wisconsin-Madison, February, 2013.
- "System Identification for Linear Time Varying Systems with Application to Rotating Turbines and Continuous Scan Laser Vibrometry," Wind Turbine Blade Workshop, Albuquerque, NM, June 1, 2012.
- "Frequency-Domain System Identification for Linear Time-Periodic Systems with Application to Wind Turbine Dynamics and CSLDV," Brüel & Kjær Sound & Vibration Measurement, Copenhagen, Denmark, May 30, 2012.
- "Nonlinear Normal Modes for Geometrically Nonlinear Structures: Computation Methods and Implications for Substructuring," Department of Mechanical and Aerospace Engineering, University of Liege, Liege, Belgium, May 29, 2012.
- "Frequency-Domain System Identification for Linear Time-Periodic Systems with Application to Wind Turbine Dynamics and CSLDV," Department of Mechanical Engineering, Chalmers University, Gothenburg, Sweden, May 24, 2012.
- "Overview of Substructuring, the Transmission Simulator Method and Dynamics Research at UW-Madison," Presentation delivered via teleconference to General Motors, Milford Proving Ground, Milford, MI, March 3, 2012.
- "Geometric Nonlinearity and Nonlinear Modes: Potential Applications to Exhaust Components," Presentation delivered via teleconference to Cummins Emissions Solutions, Stoughton, WI, Feb. 20, 2012.
- "From Lasers to Wind Turbines: Frequency-Domain System Identification for Linear Time-Periodic Systems," University of Maryland, Baltimore County, Department of Mechanical Engineering, December, 2011.
- "Experimental Modal Substructuring to Estimate Fixed-Base Modes from Tests on a Flexible Fixture," Trane / Ingersol Rand Inc., Lacrosse, WI, March, 2011.
- "From Lasers to Wind Turbines: Frequency-Domain System Identification for Linear Time-Periodic Systems," Washington University at Saint Louis, October, 2010.
- "From Lasers to Wind Turbines: Frequency-Domain System Identification for Linear Time-Periodic Systems," Rheology Research Center, University of Wisconsin-Madison, February, 2010.

- "Accelerated Vibration Testing using Continuous-Scan Laser Doppler Vibrometry (CSLDV)," WARF First Look Forum, April, 2009.
- "System Identification and Uncertainty in Dynamic Systems", Invited presentation to College of Engineering, Marquette University, Milwaukee, WI, September 2008
- "Comparison of Uncertainty Propagation / Response Surface Techniques for Two Aeroelastic Systems," Air Force Research Laboratory, Dayton, OH, August, 2008.
- "Overview of Research in System Identification and Continuous-Scan Laser Doppoler Vibrometry," ATA Engineering, Madison, WI, March 2008.
- "Mechanics Research in the Dept. of Engineering Physics," Exelon Nuclear, Chicago, IL, October 2007.
- "Effect of Uncertainty on Test-Analysis Model Correlation," Air Force Research Laboratory, Kirtland AFB, Albuquerque, NM, 2007.
- "Overview of Research in M.S. Allen Group: System Identification and Uncertainty in Dynamic Systems," Trane / Ingersol Rand Inc., Lacrosse, WI, April 2007.
- "A Multi-Input-Multi-Output (MIMO) Version of the Algorithm of Mode Isolation (AMI)," presented at the 150th Meeting of the Acoustical Society of America, Minneapolis, Minnesota, October 2005.

Other Presentations

- I. Zare, M. S. Allen, "Computing Nonlinear Frequency Response Functions (FRFs) for Systems with Iwan Joints," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- C. A. Schumann, M. S. Allen, W. J. DeLima, E. Dodgen, "Transmission Simulator Based MIMO Response Reconstruction for Vehicle Subcomponents," 38th International Modal Analysis Conference (IMAC XXXVIII), Houston, Texas, February 10-13, 2020.
- Zare, Iman, Jewell, Emily and Allen, Matthew S., "An Enhanced Static Reduction Algorithm for Predictive Modeling of Bolted Joints," in Proceedings of the 36th International Modal Analysis Conference (IMAC XXXVI), Orlando, Florida, USA, 2018.
- M. S. Allen, D. M. Aguilar, M. W. Sracic & S. Yang, "2D Continuous-Scan Laser Doppler Vibrometry Applied to Condenser Fan," 158th Meeting of the Acoustical Society of America, San Antonio, Texas, Oct. 2009.
- M. S. Allen and J. H. Ginsberg, "On the Accuracy of Modal Parameters Identified from Exponentially Windowed, Noise Contaminated Impulse Responses for a System with a Large Range of Decay Constants." 148th Meeting of the Acoustical Society of America, San Diego, California, Nov. 2004. Received the "Best Student Paper Award."

EXTRACURRICULAR / SERVICE ACTIVITIES

- Fluent in Spanish.
- Served a two-year, full-time mission in Guatemala, Central America. Taught religious and life principles and developed a strong appreciation for Latin American culture.
- Enthusiastic skier, tennis player and photographer. Also enjoy editing home videos and playing the piano.