

Michael S. Eldred

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Education

- University of Michigan, Ph.D. in Aerospace Engineering, 1993. Dissertation: *Full Order Eigenpair Perturbations with Mode Tracking Applications in Aeroelasticity and Optimization*.
- University of Michigan, M.S.E. in Aerospace Engineering, 1990.
- Virginia Tech, B.S. in Aerospace Engineering, minor in Engineering Science and Mechanics, 1989.

Professional History

- Sandia National Laboratories, Albuquerque, NM. Postdoctoral appointee (1/94 – 10/94) and technical staff member (10/94 – present). Principal investigator for DAKOTA project (<http://www.cs.sandia.gov/dakota>) since its inception, with responsibility for algorithm R&D, framework development, and capability deployment. Algorithm R&D focuses on optimization, parameter estimation, uncertainty quantification, and global sensitivity/variance analysis.
- Wright Laboratory, Dayton, OH. Visiting researcher, 6/92 – 8/92.
- Eidetics International, Torrance, CA. Summer hire engineer, 5/89 – 8/89.
- NASA Langley, Hampton, VA. Engineering aide with PRC Kentron, 5/88 – 8/88.

Professional Activities

- Associate Fellow, AIAA. Member of SIAM, ISSMO, and USACM.
- Member of AIAA MDO Technical Committee and subcommittee chairman (1996 – 2001)
- Charter member of AIAA NDA Technical Committee (2004 – present).

- Editorial board of *Structure and Infrastructure Engineering: Maintenance, Management, Life-Cycle Design and Performance*, Taylor & Francis Group.

Honors and Awards

- DOE Defense Programs Award of Excellence (2005), Sandia Employee Recognition Awards (2005, 2002, 2001), Sandia Awards For Excellence (2007, 2004, 2003, 2002, 2001, 2000, 1999, 1996).
- Department of Education Fellowship (University of Michigan, 1991 – 1993).
- Academic honoraries (Virginia Tech): Phi Eta Sigma, Tau Beta Pi, Sigma Gamma Tau.
- Scholarships: National Merit (1985), National Society of Professional Engineers (1985-1989), Virginia Scholars Program (1985-1989), Tidewater VA AIAA chapter (1985).

Research Interests

- Surrogate-based optimization with data fits, multifidelity models, and reduced-order models.
- Uncertainty quantification with probabilistic methods (reliability, generalized polynomial chaos, stochastic collocation).
- Design and model calibration under uncertainty.
- High performance computing.
- Object-oriented software design.

Book chapters

- Eldred, M.S., Bichon, B.J., Adams, B.M., and Mahadevan, S., “Overview of Reliability Analysis and Design Capabilities in DAKOTA with Application to Shape Optimization of MEMS,” *Structural Design Optimization Considering Uncertainties*, Tsompanakis, Lagaros, and Papadrakakis, eds., Structures and Infrastructures series, Vol. 1, Taylor & Francis Group, 2008, pp. 401-432.

Journal Papers

- Maute, K., Weickum, G., and Eldred, M.S., “A Reduced-Order Stochastic Finite Element Approach for Design Optimization under Uncer-

tainty,” (in review) *Structural Safety*, special issue on Optimization under Uncertainty with Emphasis on Structural Applications.

- Robinson, T.D., Willcox, K.E., Eldred, M.S., and Haimes, R., “Multi-fidelity Surrogate-Based Optimization Using Variable Design Parameterizations,” (in review) *AIAA Journal*.
- Weickum, G., Eldred, M.S., and Maute, K., “A Multi-point Approach for the Extended Reduced Order Modeling of Transient Structural Dynamics,” (in review) *Structural and Multidisciplinary Optimization*.
- Bichon, B.J., Eldred, M.S., Swiler, L.P., Mahadevan, S., and McFarland, J.M., “Multimodal Reliability Assessment for Complex Engineering Applications using Efficient Global Optimization,” (in review) *AIAA Journal*.
- Eldred, M.S., Agarwal, H., Perez, V.M., Wojtkiewicz, S.F., Jr., and Renaud, J.E., “Investigation of Reliability Method Formulations in DAKOTA/UQ,” *Structure & Infrastructure Engineering: Maintenance, Management, Life-Cycle Design & Performance*, Vol. 3, No. 3, Sept. 2007, pp. 199-213. Also appears in *Proceedings of the 9th ASCE Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability*, Albuquerque, NM, July 26-28, 2004.
- Giunta, A.A., McFarland, J. M., Swiler, L.P., and Eldred, M.S., “The promise and peril of uncertainty quantification using response surface approximations,” *Structure & Infrastructure Engineering: Maintenance, Management, Life-Cycle Design & Performance*, special issue on Uncertainty Quantification and Design under Uncertainty of Aerospace Systems, Vol. 2, Nos. 3-4, Sept.-Dec. 2006, pp. 175-189.
- Eldred, M.S., Giunta, A.A., and van Bloemen Waanders, B.G., “Multilevel Parallel Optimization Using Massively Parallel Structural Dynamics,” *Structural and Multidisciplinary Optimization*, Springer-Verlag, Vol. 27, Nos. 1-2, May 2004, pp. 97-109. Also appears as paper AIAA-2001-1625 in *Proceedings of the 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*, Seattle, WA, April 16-19, 2001.
- Eldred, M.S., Outka, D.E., Bohnhoff, W.J., Witkowski, W.R., Romero, V.J., Ponslet, E.R., and Chen, K.S., “Optimization of Complex Mechanics Simulations with Object-Oriented Software Design,” *Computer Modeling and Simulation in Engineering*, Vol. 1, No. 3, August

1996, pp. 323-352. Also appears as paper AIAA-95-1433 in *Proceedings of the 36th AIAA/ASME/ASCE/AHE/ASC Structures, Structural Dynamics, and Materials Conference*, New Orleans, LA, April 10-13, 1995, pp. 2406-2415.

- Eldred, M.S., Venkayya, V.B., and Anderson, W.J., “Mode Tracking Issues in Structural Optimization,” *AIAA Journal*, Vol. 33, No. 10, October 1995, pp.1926-1933. Also appears as paper AIAA-93-1416 in *Proceedings of the 34th AIAA/ASME/ASCE/AHE/ASC Structures, Structural Dynamics, and Materials Conference*, La Jolla, CA, April 19-22, 1993.
- Eldred, M.S., Venkayya, V.B., and Anderson, W.J., “New Mode Tracking Methods in Aeroelastic Analysis,” *AIAA Journal*, Vol. 33, No. 7, July 1995, pp.1292-1299.
- Eldred, M.S., Anderson, W.J., and Lerner, P.B., “Higher Order Eigenpair Perturbations,” *AIAA Journal*, July 1992. Also appears as paper AIAA-92-2514 in *Proceedings of the 33rd AIAA/ASME/ASCE/AHE/ASC Structures, Structural Dynamics, and Materials Conference*, Dallas, TX, April 13-15, 1992.
- Eldred, M.S., Anderson, W.J., and Lerner, P.B., “Improvement of Normalization Methods for Eigenvector Derivatives,” *AIAA Journal*, June 1992.

Conference Papers

- Eldred, M.S. and Burkardt, J., “Comparison of Non-Intrusive Polynomial Chaos and Stochastic Collocation Methods for Uncertainty Quantification,” submitted for *47th AIAA Aerospace Sciences Meeting*, Orlando, FL, Jan. 5-8, 2009.
- Eldred, M.S., Webster, C.G., and Constantine, P., “Design Under Uncertainty Employing Stochastic Expansion Methods,” to appear as paper AIAA-2008-6001 in *Proceedings of the 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Victoria, British Columbia, Canada, Sept. 10-12, 2008.
- Swiler, L.P., Adams, B.M., and Eldred, M.S., “Model Calibration under Uncertainty: Matching Distribution Information,” to appear as

paper AIAA-2008-5944 in *Proceedings of the 12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Victoria, British Columbia, Canada, Sept. 10-12, 2008.

- Eldred, M.S., Webster, C.G., and Constantine, P., “Evaluation of Non-Intrusive Approaches for Wiener-Askey Generalized Polynomial Chaos,” paper AIAA-2008-1892 in *Proceedings of the 49th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (10th AIAA Non-Deterministic Approaches Conference)*, Schaumburg, IL, April 7-10, 2008.
- Bichon, B.J., Eldred, M.S., Swiler, L.P., Mahadevan, S., and McFarland, J.M., “Multimodal Reliability Assessment for Complex Engineering Applications using Efficient Global Optimization,” paper AIAA-2007-1946 in *Proceedings of the 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (9th AIAA Non-Deterministic Approaches Conference)*, Honolulu, HI, April 23-26, 2007.
- Eldred, M.S., Adams, B.M., Copps, K.D., Carnes, B., Notz, P.K., Hopkins, M.M., and Wittwer, J.W., “Solution-Verified Reliability Analysis and Design of Compliant Micro-Electro-Mechanical Systems,” paper AIAA-2007-1934 in *Proceedings of the 48th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (9th AIAA Non-Deterministic Approaches Conference)*, Honolulu, HI, April 23-26, 2007.
- Adams, B.M., Eldred, M.S., Wittwer, J., and Massad, J., “Reliability-Based Design Optimization for Shape Design of Compliant Micro-Electro-Mechanical Systems,” paper AIAA-2006-7000 in the *Proceedings of the 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Portsmouth, VA, Sept. 6-8, 2006.
- Eldred, M.S. and Dunlavy, D.M., “Formulations for Surrogate-Based Optimization with Data Fit, Multifidelity, and Reduced-Order Models,” paper AIAA-2006-7117 in the *Proceedings of the 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Portsmouth, VA, Sept. 6-8, 2006.
- Giunta, A.A., Swiler, L.P., Brown, S.L., Eldred, M.S., Richards, M.D., and Cyr, E.C., “The Surfpack Software Library for Surrogate Modeling

of Sparse Irregularly Spaced Multidimensional Data,” paper AIAA-2006-7049 in the *Proceedings of the 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Portsmouth, VA, Sept. 6-8, 2006.

- Robinson, T.D., Willcox, K.E., Eldred, M.S., and Haimes, R., “Multifidelity Optimization for Variable-Complexity Design,” paper AIAA-2006-7114 in the *Proceedings of the 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Portsmouth, VA, Sept. 6-8, 2006.
- Eldred, M.S. and Bichon, B.J., “Second-Order Reliability Formulations in DAKOTA/UQ,” paper AIAA-2006-1828 in *Proceedings of the 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (8th AIAA Non-Deterministic Approaches Conference)*, Newport, Rhode Island, May 1 - 4, 2006.
- Robinson, T.D., Eldred, M.S., Willcox, K.E., and Haimes, R., “Strategies for Multifidelity Optimization with Variable Dimensional Hierarchical Models,” paper AIAA-2006-1819 in *Proceedings of the 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (2nd AIAA Multidisciplinary Design Optimization Specialist Conference)*, Newport, Rhode Island, May 1 - 4, 2006.
- Weickum, G., Eldred, M.S., and Maute, K., “Multi-point Extended Reduced Order Modeling For Design Optimization and Uncertainty Analysis,” paper AIAA-2006-2145 in *Proceedings of the 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (2nd AIAA Multidisciplinary Design Optimization Specialist Conference)*, Newport, Rhode Island, May 1 - 4, 2006.
- Eldred, M.S., Bichon, B.J., and Adams, B.M., “Overview of Reliability Analysis and Design Capabilities in DAKOTA,” *Proceedings of the NSF Workshop on Reliable Engineering Computing (REC 2006)*, Savannah, GA, February 22-24, 2006.
- Eldred, M.S., Giunta, A.A., and Collis, S.S., “Second-Order Corrections for Surrogate-Based Optimization with Model Hierarchies,” paper AIAA-2004-4457 in *Proceedings of the 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Albany, NY, Aug. 30 - Sept. 1, 2004.

- Giunta, A.A., Eldred, M.S., Swiler, L.P., Trucano, T.G., and Wojtkiewicz, S.F., Jr., “Perspectives on Optimization Under Uncertainty: Algorithms and Applications” paper AIAA-2004-4451 in *Proceedings of the 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Albany, NY, Aug. 30 - Sept. 1, 2004.
- Perez, V.M., Eldred, M.S., and Renaud, J.E., “Solving the Infeasible Trust-region Problem Using Approximations,” paper AIAA-2004-4312 in *Proceedings of the 10th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Albany, NY, Aug. 30 - Sept. 1, 2004.
- Giunta, A.A., Eldred, M.S., and Castro, J.P., “Uncertainty Quantification Using Response Surface Approximations,” *Proceedings of the 9th ASCE Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability*, Albuquerque, NM, July 26-28, 2004.
- Perez, V.M., Eldred, M.S., and Renaud, J.E., “An rSQP Approach for a Single-Level Reliability Optimization,” *Proceedings of the 9th ASCE Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability*, Albuquerque, NM, July 26-28, 2004.
- Giunta, A.A., Wojtkiewicz, S.F., Jr., and Eldred, M.S., “Overview of Modern Design of Experiments Methods for Computational Simulations,” paper AIAA-2003-0649 in *Proceedings of the 41st AIAA Aerospace Sciences Meeting and Exhibit*, Reno, NV, Jan. 6-9, 2003.
- Eldred, M.S., Giunta, A.A., Wojtkiewicz, S.F., Jr., and Trucano, T.G., “Formulations for Surrogate-Based Optimization Under Uncertainty,” paper AIAA-2002-5585 in *Proceedings of the 9th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, Atlanta, GA, Sept. 4-6, 2002.
- Giunta, A.A., Eldred, M.S., Trucano, T.G., and Wojtkiewicz, S.F., Jr., “Optimization Under Uncertainty Methods for Computational Shock Physics Applications,” paper AIAA-2002-1642 in *Proceedings of the 43rd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference (Nondeterministic Approaches Forum)*, Denver, CO, April 22-25, 2002.
- Wojtkiewicz, S.F., Jr., Eldred, M.S., Field, R.V., Jr., Urbina, A., and Red-Horse, J.R., “A Toolkit For Uncertainty Quantification In Large Computational Engineering Models,” paper AIAA-2001-1455 in

Proceedings of the 42nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, Seattle, WA, April 16-19, 2001.

- Eldred, M.S., Hart, W.E., Schimel, B.D., and van Bloemen Waanders, B.G., “Multilevel Parallelism for Optimization on MP Computers: Theory and Experiment,” paper AIAA-2000-4818 in *Proceedings of the 8th AIAA/USAF/NASA/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, Long Beach, CA, September 6-8, 2000.
- Giunta, A.A., and Eldred, M.S., “Implementation of a Trust Region Model Management Strategy in the DAKOTA Optimization Toolkit,” paper AIAA-2000-4935 in *Proceedings of the 8th AIAA/USAF/NASA/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, Long Beach, CA, September 6-8, 2000.
- Eldred, M.S., and Schimel, B.D., “Extended Parallelism Models for Optimization on Massively Parallel Computers,” paper 16-POM-2 in *Proceedings of the 3rd World Congress of Structural and Multidisciplinary Optimization (WCSMO-3)*, Amherst, NY, May 17-21, 1999.
- Eldred, M.S., and Hart, W.E., “Design and Implementation of Multilevel Parallel Optimization on the Intel TeraFLOPS,” paper AIAA-98-4707 in *Proceedings of the 7th AIAA/USAF/NASA/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, St. Louis, MO, Sept. 2-4, 1998, pp. 44-54.
- Blackwell, B.F., and Eldred, M.S., “Application of Reusable Interface Technology for Thermal Parameter Estimation,” *Proceedings of the 32nd National Heat Transfer Conference*, Vol. 2, Eds. Dulikravitch, G.S., and Woodbury, K.E., HTD-Vol. 340, August 1997, pp. 1-8.
- Eldred, M.S., Hart, W.E., Bohnhoff, W.J., Romero, V.J., Hutchinson, S.A., and Salinger, A.G., “Utilizing Object-Oriented Design to Build Advanced Optimization Strategies with Generic Implementation,” paper AIAA-96-4164 in *Proceedings of the 6th AIAA/USAF/NASA/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, Bellevue, WA, Sept. 4-6, 1996, pp. 1568-1582.
- Ponslet, E.R., and Eldred, M.S., “Discrete Optimization of Isolator Locations for Vibration Isolation Systems: an Analytical and Experimental Investigation,” paper AIAA-96-4178 in *Proceedings of the 6th*

AIAA/USAF/NASA/ISSMO Symposium on Multidisciplinary Analysis and Optimization, Bellevue, WA, Sept. 4-6, 1996, pp. 1703-1716. Also appears as Sandia Technical Report SAND96-1169, May 1996.

- Harding, D.C., Eldred, M.S., and Witkowski, W.R., “Integration of Finite Element Analysis and Numerical Optimization Techniques for RAM Transport Package Design,” *Proceedings of the 11th International Conference on the Packaging and Transportation of Radioactive Materials (PATRAM '95)*, Las Vegas, NV, Dec. 3-8, 1995.
- Harding, D.C., and Eldred, M.S., “Radioactive Material Transportation Package Design Using Numerical Optimization Techniques,” *Proceedings of the 1995 Joint ASME/JSME Pressure Vessels and Piping Conference*, Honolulu, Hawaii, July 23-27, 1995, Vol. PVP-307, pp. 29-36.
- Romero, V.J., Eldred, M.S., Bohnhoff, W.J., and Outka, D.E., “Application of Optimization to the Inverse Problem of Finding the Worst-Case Heating Configuration in a Fire,” *Proceedings of the 9th International Conference on Numerical Methods in Thermal Problems*, Atlanta, GA, July 17-21, 1995, Vol. 9, Part 2, pp. 1022-1033.
- Witkowski, W.R., Eldred, M.S., and Harding, D.C., “Integration of Numerical Analysis Tools for Automated Numerical Optimization of a Transportation Package Design,” *Proceedings of the 5th AIAA/NASA/USAF/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, paper AIAA94-4259, Panama City Beach, FL, Sept. 7-9, 1994.

Conference Abstracts

- Eldred, M.S., “Experiences with nonintrusive polynomial chaos and stochastic collocation methods for uncertainty analysis and design,” *SIAM Conference on Computational Science and Engineering (CSE09)*, Miami, FL, March 2-6, 2009.
- Maute, K., Weickum, G., and Eldred, M.S., “Stochastic Reduced-Order Modeling Techniques for Design Under Uncertainty,” *Proceedings of the 8th World Congress on Computational Mechanics (WCCM8)*, Venice, Italy, June 30 - July 5, 2008.
- Carnes, B., Copps, K.D., Eldred, M.S., Adams, B.M., Wittwer, J.W., “Coupled a posteriori error estimation and uncertainty quantification

for a nonlinear elasticity MEMS problem,” abstract for *SIAM Conference on Computational Science and Engineering (CSE07)*, Costa Mesa, CA, February 19-23, 2007.

- Dunlavy, D.M. and Eldred, M.S., “Formulations for Surrogate-Based Optimization Using Data Fit and Multifidelity Models,” abstract for *SIAM Conference on Computational Science and Engineering (CSE07)*, Costa Mesa, CA, February 19-23, 2007.
- Robinson, T.D., Willcox, K.E., Eldred, M.S., and Haimes, R., “Multifidelity Optimization for Variable-Complexity Design,” abstract submitted for *Second International Workshop on Surrogate Modeling and Space Mapping for Engineering Optimization*, Lyngby, Denmark, Nov. 9-11, 2006.
- Adams, B.M., Eldred, M.S., and Swiler, L.P., “Uncertainty Quantification and Reliability Analysis-Based Design Optimization Capabilities in DAKOTA,” abstract submitted for *Ninth Copper Mountain Conference on Iterative Methods*, Copper Mountain, CO, April 7, 2006.
- Giunta, A.A., Castro, J.P., Hough, P.D., Gray, G.A., Eldred, M.S., “Multifidelity Modeling Approaches in Simulation-Based Optimization,” abstract for the *SIAM Conference on Optimization*, Stockholm, Sweden, May 15-19, 2005.
- Giunta, A.A., Eldred, M.S., Hough, P.D., and Castro, J.P., “Overview of Surrogate-Based Optimization Research and Applications at Sandia National Laboratories,” abstract for the *Surrogate Optimization Workshop*, Houston, TX, May 24-25, 2004.
- Giunta, A.A. and Eldred, M.S., “Robust Design Optimization Using Surrogate Models,” abstract for the *Robust Optimization-Directed Design (RODD) Conference*, Shalimar, FL, April 19-21, 2004.
- Giunta, A.A., Eldred, M.S., Wojtkiewicz, S.F., Jr., Trucano, T.G., and Castro, J.P., “Surrogate-Based Optimization Methods for Engineering Design,” abstract in *Proceedings of the Fifth Biennial Tri-Laboratory Engineering Conference on Computational Modeling*, Santa Fe, NM, October 21-23, 2003.
- Giunta, A. A., and Eldred, M. S., “Surrogate-Based Optimization Under Uncertainty: Formulations and Applications” abstract in the *Pro-*

ceedings of the 18th International Symposium on Mathematical Programming, Copenhagen, Denmark, Aug. 2003.

- Eldred, M.S., Giunta, A.A., Wojtkiewicz, S.F., Jr., and Trucano, T.G., “Formulations for Surrogate-Based Optimization Under Uncertainty,” abstract in *Proceedings of the 7th U.S. National Congress on Computational Mechanics*, Albuquerque, NM, July 28-30, 2003.
- Giunta, A.A. and Eldred, M.S., “Engineering Design Optimization Algorithms: Theory and Practice,” abstract in *Proceedings of the 7th U.S. National Congress on Computational Mechanics*, Albuquerque, NM, July 28-30, 2003.
- Eldred, M.S., Giunta, A.A., Wojtkiewicz, S.F., Jr., and Trucano, T.G., “Surrogate-Based Optimization Under Uncertainty: Status and Directions,” abstract in *SIAM Conference on Computational Science and Engineering. Final Program and Abstracts*, San Diego, CA, Feb 10-13, 2003.
- Giunta, A.A. and Eldred, M.S., “Case Studies in Computational Engineering Design Optimization: Challenges and Solutions,” abstract in *SIAM Conference on Computational Science and Engineering. Final Program and Abstracts*, San Diego, CA, Feb 10-13, 2003.
- Eldred, M.S., “DAKOTA: Virtual Prototyping with Large-Scale Engineering Simulations,” abstract in *IMA Workshop 4: Optimization in Simulation-Based Models*, Minneapolis, MN, January 9-16, 2003.
- Eldred, M.S., “The DAKOTA Optimization Framework: Virtual Prototyping with ASCI-Scale Simulations,” abstract in *Proceedings of the Fourth Biennial Tri-Laboratory Engineering Conference on Computational Modeling*, Albuquerque, NM, Oct. 23-24, 2001, p. 82.
- Wojtkiewicz, S.F., Jr., Field, R.V., Jr., Eldred, M.S., Red-Horse, J.R., and Urbina, A., “Uncertainty Quantification in Large Computational Engineering Models,” abstract in *Proceedings of the Fourth Biennial Tri-Laboratory Engineering Conference on Computational Modeling*, Albuquerque, NM, Oct. 23-24, 2001, p. 11.
- Wojtkiewicz, S.F., Jr., Eldred, M.S., Field, R.V., Jr., Urbina, A., Red-Horse, J.R., and Giunta, A.A., “DAKOTA/UQ: A Toolkit for Uncertainty Quantification in a Multiphysics, Massively Parallel Computational Environment,” presented as (1) poster at *ODU-NASA Training*

Workshop on Nondeterministic Approaches and Their Potential for Future Aerospace Systems, held in Langley, Virginia, May 30-31, 2001, (2) abstract (no proceedings) at *USNCCM VI (Sixth United States Congress on Computational Mechanics)* held in Dearborn, Michigan, August 1-3, 2001, and (3) abstract (no proceedings) at *LLNL Sensitivity Analysis Workshop*, August 16-17, 2001.

- Hart, W.E., Eldred, M.S., and Giunta, A.A., “Solving mixed-integer nonlinear problems with PICO,” abstract in proceedings of the *17th International Symposium on Mathematical Programming (ISMP 2000)*, Atlanta, GA, August 7-11, 2000.
- van Bloemen Waanders, B.G., Eldred, M.S., Hart, W.E., Schimel, B.D., and Giunta, A.A., “A Review of the Dakota Toolkit, Multilevel Parallelism for Complex PDE Simulations on TeraFLOP Computers,” abstract presented in the *Optimization in Engineering Minisymposium* at the *SIAM Annual Meeting*, Rio Grande, Puerto Rico, July 10-14, 2000.
- Romero, V.J., Painton, L.A., and Eldred, M.S., “Optimization Under Uncertainty: Shifting of Maximum Vulnerability Point Due to Uncertain Failure Thresholds,” 1997 INFORMS Spring Meeting, San Diego, CA, May 1997.
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SAND Reports

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Williams, P.J., “DAKOTA, A Multilevel Parallel Object-Oriented Framework for Design Optimization, Parameter Estimation, Uncertainty Quantification, and Sensitivity Analysis: Version 4.0 Users Manual,” Sandia Technical Report SAND2006-6337, October 2006. Updated September 2007 (Version 4.1).

- Eldred, M.S., Brown, S.L., Adams, B.M., Dunlavy, D.M., Gay, D.M., Swiler, L.P., Giunta, A.A., Hart, W.E., Watson, J.-P., Eddy, J.P., Griffin, J.D., Hough, P.D., Kolda, T.G., Martinez-Canales, M.L. and Williams, P.J., “DAKOTA, A Multilevel Parallel Object-Oriented Framework for Design Optimization, Parameter Estimation, Uncertainty Quantification, and Sensitivity Analysis: Version 4.0 Reference Manual,” Sandia Technical Report SAND2006-4055, October 2006. Updated September 2007 (Version 4.1).
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- Eldred, M.S., Giunta, A.A., van Bloemen Waanders, B.G., Wojtkiewicz, S.F., Jr., Hart, W.E., and Alleva, M.P., “DAKOTA, A Multilevel Parallel Object-Oriented Framework for Design Optimization, Parameter Estimation, Uncertainty Quantification, and Sensitivity Analysis. Version 3.0 Users Manual.” Sandia Technical Report SAND2001-3796, April 2002. Updated April 2003 (Version 3.1).
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- Eldred, M.S., “Optimization Strategies for Complex Engineering Applications,” Sandia Technical Report SAND98-0340, February 1998.