Teresa Portone

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Optimization and Uncertainty Quantification, Sandia National Labs
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EDUCATION

M.S., Ph.D., Computational Science, Engineering and Mathematics. University of Texas at Austin

B.S., Mathematics. Minor in Italian. University of Alabama

PROFESSIONAL INTERESTS

Developing and applying advanced UQ methodologies for practical (large-scale) science and engineering problems. Experience in Bayesian inference, Bayesian model selection, global sensitivity analysis, multifidelity UQ, and model-form uncertainty/error. Wide range of application-area experience, including subsurface transport, hypersonic ablation, material modeling, structural dynamics, and disease modeling.

EXPERIENCE

Sandia National Laboratories, Albuquerque, NM

PRINCIPAL MEMBER OF THE TECHNICAL STAFF, 2024 - PRESENT

SENIOR MEMBER OF THE TECHNICAL STAFF, 2020 - 2024

Developing and deploying state-of-the-art uncertainty quantification (UQ) methods to practical application problems, including nuclear waste repository performance assessment, nuclear deterrence applications, and disease modeling. Particular focus on Bayesian inference, model-form uncertainty, sensitivity analysis, and multifidelity UQ.

Center for Predictive Engineering and Computational Science, UT Austin

GRADUATE RESEARCH ASSISTANT, AUGUST 2014 - DECEMBER 2019

Advisor: Dr. Robert D. Moser. Developed a novel model-form uncertainty representation for an upscaled model of contaminant transport through heterogeneous porous media.

Sandia National Laboratories, Albuquerque, NM

GRADUATE INTERN, OCTOBER 2017 - DECEMBER 2017

Supervisors: Laura Swiler, John Niederhaus, Jason Sanchez. Applied Bayesian model selection to closure models for yield strength of hardened steel.

PUBLICATIONS

PREPRINT

Bandy, R., Morrison, R., Mussoni, E., & **Portone, T.** (2025). *Hybrid Physics-Data Enrichments to Represent Uncertainty in Reduced Gas-Surface Chemistry Models for Hypersonic Flight*. https://arxiv.org/abs/2509.08137

Crislip, E., Khalil, M., **Portone, T.**, Chkrebtii, O., & Neal, K. (2025). *Closure Term Estimation in Spatiotemporal Models of Dynamical Systems*. https://arxiv.org/abs/2511.20869

Portone, T., Debusschere, B., Yang, S., Islas-Quinones, E., & Xiao, T. P. (2025). *Scalable extensions to given-data Sobol' index estimators*. https://arxiv.org/abs/2509.09078

Portone, T., White, R. D., & Hart, J. L. (2025). *Quantifying model prediction sensitivity to model-form uncertainty*. https://arxiv.org/abs/2509.08708

JOURNAL

Portone, T., Eckert, A., Basurto, E., Friedman-Hill, E., & Swiler, L. (2024). GDSA framework, a computational framework for complex modeling problems in radioactive waste management. *Nuclear Engineering and Technology*. https://doi.org/10.1016/j.net.2024.06.008

Brooks, D. M., Swiler, L. P., Stein, E., Mariner, P. E., Basurto, E., **Portone, T.**, Eckert, A., & Leone, R. (2022). Sensitivity analysis of generic deep geologic repository with focus on spatial heterogeneity induced by stochastic

fracture network generation. *Advances in Water Resources*, *169*, 104310. https://doi.org/10.1016/j.advwatres.2022.104310

Portone, T., & Moser, R. D. (2022). Bayesian Inference of an Uncertain Generalized Diffusion Operator. *SIAM/ASA Journal on Uncertainty Quantification*, 151–178. https://doi.org/10.1137/21M141659X

Portone, T., Niederhaus, J., Sanchez, J., & Swiler, L. (2020). Bayesian model selection for metal yield models in high-velocity impact. *International Journal of Impact Engineering*, *137*, 103459. https://doi.org/10.1016/j.ijimpeng.2019.103459

CONFERENCE

Bandy, R., **Portone, T.**, & Morrison, R. (2025). Stochastic Model Correction for the Adaptive Vibration Isolation Round-Robin Challenge. In R. Platz, G. Flynn, K. Neal, & S. Ouellette (Eds.), *Model Validation and Uncertainty Quantification, Vol. 3* (pp. 53–62). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-68893-5_8

Portone, T., Roettgen, D., Neal, K., & Debusschere, B. (2024, January). A preliminary quantification of uncertainties in dynamic substructuring and the frame-wing problem. *Proceedings of the IMAC XLII Conference*.

Bandy, R., Washington, R., Morrison, R. E., & **Portone, T.** (2025, February). Isolating and Quantifying Uncertainties in the Vibration Isolation Round-Robin Challenge. *Proceedings of the IMAC XLIII Conference*.

Brooks, D. M., Swiler, Laura P., Mariner, P. E., **Portone, Teresa**, Basurto, E., & Leone, R. C. (2022). Sensitivity and Uncertainty Analysis of FMD Model Choice for a Generic Crystalline Repository. *Proceedings of the International High-Level Radioactive Waste Management Conference*, 390–394. https://www.ans.org/pubs/proceedings/article-52705/

Mariner, P. E., Basurto, E., Brooks, D. M., Leone, R. C., **Portone, Teresa**, & Swiler, Laura P. (2022). Use of Virtual Tracers in Repository Performance Assessment Modeling. *Proceedings of the International High-Level Radioactive Waste Management Conference*, 386–389. https://www.ans.org/pubs/proceedings/article-52704/

Neal, K. D., Khalil, M., & **Portone, T.** (2024). *Investigating Model Form Error Estimation for Sparse Data*. *16*(1). https://doi.org/10.36001/phmconf.2024.v16i1.4081

Smith, M., **Portone, T.**, & Swiler, L. (2022). *Effects of Fracture Transmissivity Relationship on Repository Performance Characteristics*. ARMA-DFNE-22-0007. https://doi.org/10.56952/ARMA-DFNE-22-0007

Smith, M., **Portone, Teresa**, & Swiler, Laura P. (2022). Effects of Discrete Fracture Network Modeling Choices on Repository Performance Characteristics. *Proceedings of the International High-Level Radioactive Waste Management Conference*, 395–399. https://www.ans.org/pubs/proceedings/article-52706/

Portone, Teresa, Eldred, Mike, Geraci, Gianluca, & Swiler, Laura P. (2022). Multimodel Methods for Uncertainty Quantification of Repository Systems. *Proceedings of the International High-Level Radioactive Waste Management Conference*, 81–86. https://www.ans.org/pubs/proceedings/article-52660/

TECHNICAL REPORT

Portone, T., Brooks, D. M., & Swiler, L. P. (2025). *Challenges in quantifying unparameterized spatial uncertainties in deep geologic repositories for nuclear waste* (SAND2025-11240). https://doi.org/10.2172/2588881

Portone, T., & White, R. D. (2025). *Theoretical and methodological challenges in hierarchical Bayesian inference for model-form uncertainty* (Sandia Technical Report SAND2025-10780). https://doi.org/10.2172/2587508

Portone, T., White, R. D., & Bandy, R. (2025). *Assessing and Enabling Trustworthy Predictions for High-Consequence Decisions* (Sandia Technical Report SAND2025-12656R). https://doi.org/10.2172/2999140

Swiler, L. P., Basurto, E., Brooks, D. M., LaForce, T. C., Leone, R. C., Mariner, P. E., **Portone, T.**, Condon, C., Hargraves, J., & Hay, T. (2025). *Uncertainty and Sensitivity Analysis Methods and Applications in the GDSA Framework (FY2025)*. https://doi.org/10.2172/2589619

Swiler, L. P., Basurto, E., Brooks, D. M., LaForce, T., Leone, R., Mariner, P. E., **Portone, T.**, Condon, C., Hargraves, J., & Hay, T. (2024). *Uncertainty and Sensitivity Analysis Methods and Applications in the GDSA Framework (FY2024)* (SAND2024-11075R).

Swiler, L. P., Brooks, D. M., **Portone, T.**, Basurto, E., Mariner, P. E., & Leone, R. (2023). *Uncertainty and Sensitivity Analysis Methods and Applications in the GDSA Framework (FY2023)* (SAND2023-08550R). https://doi.org/10.2172/1884909

Portone, T., White, R. D., Rosso, H., Bandy, R. J., & Hart, J. L. (2023). *Quantifying model prediction sensitivity to model-form uncertainty* (SAND-2023-10274R). https://doi.org/10.2172/2430314

Acquesta, E., **Portone, T.**, Dandekar, R., Rackauckas, C., Bandy, R., & Huerta, J. (2022). *Model-Form Epistemic Uncertainty Quantification for Modeling with Differential Equations: Application to Epidemiology.* (SAND2022-12823). Sandia National Lab.(SNL-NM), Albuquerque, NM (United States). https://doi.org/10.2172/1888443

Adams, B. M., Eldred, M. S., Geraci, G., **Portone, T.**, Ridgway, E. M., Stephens, J. A., & Wildey, T. M. (2022). *Deployment of Multifidelity Uncertainty Quantification for Thermal Battery Assessment Part I: Algorithms and Single Cell Results* (SAND2022-11856). https://doi.org/10.2172/1885882

Mullins, J., **Portone, T.**, Carnes, B., Schroeder, B., Maupin, K., Coleman, R., Huerta, G., Neal, K., Butler, K., & Gilmore, W. (2022). *Transfer of Uncertainty Quantification from Past Computational Simulations to Support New Applications* (SAND2022-14404). https://doi.org/10.2172/1884909

Swiler, L. P., Basurto, E., Brooks, D. M., Eckert, A. C., Leone, R., Mariner, P. E., **Portone, T.**, & Smith, M. L. (2022). *Uncertainty and Sensitivity Analysis Methods and Applications in the GDSA Framework (FY2022)* (SAND2022-11220R). https://doi.org/10.2172/1884909

Swiler, L. P., Basurto, E., Brooks, D. M., Eckert, A. C., Leone, R., Mariner, P. E., **Portone, T.**, Smith, M. L., & Stein, E. R. (2021). *Uncertainty and Sensitivity Analysis Methods and Applications in the GDSA Framework (FY2021)* (SAND2021-9903R). https://doi.org/10.2172/1855018

Beyeler, W. E., Frazier, C. R., Krofcheck, D. J., Swiler, L. P., **Portone, T.**, & Klise, K. A. (2020). *Uncertainty Analysis Framework for the Hospital Resource Supply Model for Covid-19* (SAND-2020-5569). https://doi.org/10.2172/1763544

Safta, C., Ray, J., Acquesta, E., Catanach, T. A., Chowdhary, K. S., Debusschere, B., Galvan, E., Geraci, G., Khalil, M., & **Portone, T.** (2020). *Characterization of Partially Observed Epidemics—Application to COVID-19* (SAND-2020-6563). https://doi.org/10.2172/1763554

Swiler, L. P., Basurto, E., Brooks, D. M., Eckert, A. C., Mariner, P. E., **Portone, T.**, & Stein, E. R. (2020). *Advances in Uncertainty and Sensitivity Analysis Methods and Applications in GDSA Framework.* (SAND-2020-10802R). https://doi.org/10.2172/1671381

OTHER

Portone, T. (2019). *Representing model-form uncertainty from missing microstructural information* [University of Texas at Austin]. http://dx.doi.org/10.26153/tsw/10112

PRESENTATIONS

INVITED

Beyond parametric uncertainty: quantifying model-form uncertainty in model predictions. UW Madison Applied and Computational Math Seminar, Madison, WI, USA, October 2024.

What if your governing equations are uncertain? Quantifying model-form uncertainty in model predictions. USACM Uncertainty Quantification and Probabilistic Modeling Technical Thrust Area Webinar. Virtual. June 2024.

Why you should never evaluate your model just once: a brief introduction to uncertainty quantification. Presentation to the Computational Science Center at National Renewable Energy Lab. May 2024.

How reliable are mathematical model predictions if their equations are uncertain? University of New Mexico Applied Mathematics Seminar, Albuquerque, NM, April 2024.

A stochastic operator model-form uncertainty representation of missing microstructural information. AGU Fall Meeting 2022, Chicago, IL, USA, December 2022.

A brief survey of uncertainty quantification. University of Alabama Mathematics Colloquium, November 2022.

A Whirlwind Tour of Uncertainty Quantification and Model Inadequacy. National Renewable Energy Laboratory, September 2018.

CONFERENCE AND OTHER

Assessing assumption importance to model outputs for prediction and validation. T. Portone, R. White, R. Bandy. 18th U.S. National Congress on Computational Mechanics (USNCCM18). Chicago, IL, USA. July 2025.

Computing Sobol' main effects indices with unstructured samples for discrete random variables and streaming data. T. Portone, B. Debusschere, S. Yang, E. Islas Quinones, T.P. Xiao. 14th International Conference on Structural Safety and Reliability (ICOSSAR'25). Los Angeles, CA, USA. June 2025.

Trustworthy and Scalable Data-Driven Closure Models. T. Portone, M. Khalil, K. Neal. 16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics. Vancouver, BC, Canada. July 2024.

Enabling Quantitative Assessment of Validation Relevance to Model Predictions. T. Portone, R. Bandy, R. White. ASME 2024 Verification, Validation, and Uncertainty Quantification Symposium (VVUQ2024). College Station, TX, USA. May 2024.

Assessing Model Prediction Trustworthiness in the Presence of Model-Form Uncertainty. T. Portone, R. White, J. Hart. SIAM UQ24. Trieste, Italy, February 2024.

Quantifying Model Prediction Sensitivity to Model-Form Uncertainty. T. Portone, J. Hart, R. White. USACM17. Albuquerque, NM, July 2023.

Model-form uncertainty for digital twins. T. Portone. AIRES 4 Workshop: Machine Learning for Robust Digital Twins. Oak Ridge, TN, USA, April 2023.

Quantifying Model Prediction Sensitivity to Model-Form Uncertainty. T. Portone, J. Hart, R. White. SIAM CSE23. Amsterdam, The Netherlands, March 2023.

Sensitivity analysis for deep geologic repository simulations in crystalline rock. T. Portone, P. Mariner, M. Smith, E. Basurto, R. Leone, E. Stein, L. Swiler. AGU Fall Meeting 2022, Chicago, IL, USA, December 2022.

Multimodel Methods for Uncertainty Quantification of Repository Systems. T. Portone, G. Geraci, L. Swiler, M. Eldred. International High-Level Radioactive Waste Management Conference, Phoenix, AZ, USA, November 2022.

Quantifying model-form uncertainty with an application to subsurface transport. T. Portone. University of Alabama Applied Mathematics Seminar Series, November 2022.

Data-Driven Model-Form Uncertainty with Bayesian Statistics and Neural Differential Equations. T. Portone, E. Acquesta, R. Dandekar, C. Rackauckas. 8th ECCOMAS, Oslo, Norway, June 2022.

Physics-Constrained Bayesian Inference of an Uncertain Operator in the Sparse-Data Regime. T. Portone, R.D. Moser. SIAM UQ22. Atlanta, GA, April 2022.

Learning Missing Mechanisms in a Dynamical System from a Subset of State Variable Observations. T. Portone, E. Acquesta, R. Dandekar, C. Rackauckas. USNCCM16, Virtual, July 2021.

Application of Multifidelity Uncertainty Quantification Methods to a Subsurface Transport Model. T. Portone, M.S. Eldred, G. Geraci, L.P. Swiler. SIAM CSE21. Virtual, March 2021.

Characterizing model-form uncertainty in an inadequate model of anomalous transport. T. Portone, R.D. Moser. SIAM UQ 2020. Virtual minisymposium, May 2020.

Bayesian model selection for metal yield models in high-velocity impact. T. Portone, J.H. Niederhaus, J.J. Sanchez, L.P. Swiler. 2019 Hypervelocity Impact Symposium, Destin, Florida, April 2019.

An Uncertainty Representation for Model Inadequacy in a Field-scale Contaminant Transport Model. T. Portone, R.D. Moser. SIAM CSE 2019. Spokane, WA. February 2019.

A Stochastic Operator Approach to Representing Model Inadequacy. T. Portone, R.D. Moser, ICES Student Forum, February 2018.

A Stochastic Operator Approach to Model Inadequacy with Applications to Contaminant Transport. T. Portone, D. McDougall, R.D. Moser, SIAM CSE 2017, Atlanta, GA, February 2017.

Uncertainty Due to Inadequate Models of Scalar Dispersion in Porous Media. T. Portone, D. McDougall, J. Rigelo, T. Oliver, R.D. Moser. SIAM UQ 2016, Lausanne, Switzerland, April 2016.

AWARDS

2025	Culture Champions Sandia Employee Recognition Award, CSRI Internship Institute Mentorship Team
2021	Technical Excellence Sandia Employee Recognition Award, DOE COVID Epidemiology Modeling Team.

2019	Rising Stars in Computational & Data Sciences Attendee
2015	Honorable Mention, NSF Graduate Research Fellowship Program
2013-2017	CSEM Fellowship, UT Austin, Oden Institute for Computational Engineering and Sciences
Undergrad Honors	B.B. Comer Math Prize two-time recipient, awarded to one student annually by the University of Alabama's mathematics department; Distinguished Undergraduate Scholar (awarded to eight seniors in 2013); Phi Beta Kappa; Pi Mu Epsilon.

LEADERSHIP & SERVICE ACTIVITIES

2025-Present	Secretary, SIAM Uncertainty Quantification Activity Group
2021-Present	Rising Stars Organizing Committee.
2020-Present	Sandia Advanced Science & Technology Division Workplace Improvement Network Member.
2020-2024	Co-organizer, Sandia UQ Working Group.
2020-2022	Black Leadership Committee's Research Partnerships Awareness & Engagement committee member. Sandia recruiting team member. Organizer, Sandia UQ Seminar Series.
2020-2021	Co-founder and co-organizer of 1463 Early-Career Group.
Reviewed for	Journal of the Royal Society Interface; Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences; Numerical Algebra, Control and Optimization; ASME Journal of VVUQ; International Journal of Uncertainty Quantification; International Journal of High Performance Computing Applications; International Journal of Multiscale Computational Engineering.
Student Leadership	CSEM Student Representative, UT Austin SIAM Student Chapter Representative (2014-2016). Graduate Student Assembly Representative (2015-2016). Secretary of Pi Mu Epsilon University of Alabama chapter (2012-2013).

TEACHING & MENTORING

I have mentored 4 undergraduate and graduate student interns. One has converted to a staff position at Sandia, one to a postdoctoral appointee under my supervision, and one to a graduate intern while pursuing a master's degree in ECE at the University of New Mexico.

PROFESSIONAL MEMBERSHIPS

Member, Society for Industrial and Applied Mathematics (SIAM)

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