STEVEN ANDREW MATTIS

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EDUCATION

The University of Texas at Austin, Austin, TX, Ph.D., Computational and Applied Mathematics (Interdisciplinary Program in Computational Science, Engineering and Mathematics), August, 2013

The University of Texas at Austin, Austin, TX, M.S., Computational and Applied Mathematics (Interdisciplinary Program in Computational Science, Engineering and Mathematics), August, 2010

The University of Notre Dame, Notre Dame, IN, B.S., Mathematics, May, 2008

FIELDS OF INTEREST

Computational Hydrology, Data-Driven Modeling, Scientific Computing, Flow in Porous Media, Fluid-Structure Interaction, Uncertainty Quantification, Transport Models, Error Estimation, Machine Learning

APPOINTMENTS

Senior Multidisciplinary Research Engineer, Naval Nuclear Laboratory, West Mifflin, PA, pending security clearance

Temporary Postdoctoral Researcher, Colorado State University, Department of Statistics (working remotely in Pittsburgh, PA), Supervisors: Don Estep and Troy Butler, November 2019-present

Data-Driven Modeling Consultant, self-employed (consulting for academic and industrial research groups), Pittsburgh, PA, June 2019-November 2019

Postdoctoral Researcher, Technical University of Munich, Department of Mathematics, Supervisor: Barbara Wohlmuth, October 2016-June 2019

Postdoctoral Researcher, The University of Texas at Austin, Institute for Computational Engineering and Sciences, Supervisor: Clint Dawson, August 2013-September 2016

Lecturer, The University of Texas at Austin, Department of Aerospace Engineering and Engineering Mechanics, August 2014-May 2015

Graduate Research Assistant, The University of Texas at Austin, Institute for Computational Engineering and Sciences, Supervisor: Clint Dawson, August 2008-August 2013

Undergraduate Researcher, The University of Notre Dame, Department of Mathematics, Supervisor: Jeffrey Diller, November 2006-May 2008

Summer Researcher, North Carolina State Univeristy, Department of Mathematics, NSF Research Experience for Undergraduates, Supervisor: Sharon Lubkin, June 2007-August 2007

Grader, The University of Notre Dame, Department of Mathematics, August 2006-May 2008

PROFESSIONAL AFFILIATIONS

Officer, Society for Industrial and Applied Mathematics UT Student Chapter, 2009-2012.

Member, Society for Industrial and Applied Mathematics, 2008-Present.

Member, American Geophysical Union, 2014-Present.

HONORS, AWARDS, & FELLOWSHIPS

SIAM Student Travel Award, SIAM Geosciences, 2013

SIAM Student Chapter Certificate of Recognition, 2013

National Defense Science and Engineering Graduate Fellowship, 2010-2013

The Graduate Dean's Prestigious Fellowship Supplement Award, 2010-2011, 2012-2013

Computational and Applied Mathematics Graduate Fellowship, University of Texas at Austin, 2009-2010.

Graduated Magna Cum Laude in The College of Science, University of Notre Dame

DISSERTATIONS & THESES

Mattis, Steven A. "Mathematical Modeling of Flow Through Vegetated Regions." Ph.D. Dissertation, The University of Texas at Austin, August, 2013

Mattis, Steven A. "Periodicity in One-Dimensional Dynamics." Undergraduate Thesis, The University of Notre Dame, May, 2008

JOURNAL ARTICLES

Bittner, D., Parente, M. T., Mattis, S., Wohlmuth, B., and Chiogna, G. "Identifying relevant hydrological and catchment properties in active subspaces: An inference study of a lumped karst aquifer model." *Advances in Water Resources* 135 (2020): 103472

Parente, M. T., Bittner, D., Mattis, S., Chiogna, G., and Wohlmuth, B. "Bayesian calibration and sensitivity analysis for a karst aquifer model using active subspaces." *Water Resources Research* 55.8 (2019): 7086-7107

Mattis, S. and T. Butler, "Enhancing piecewise defined surrogate response surfaces with adjoints on sets of unstructured samples to solve stochastic inverse problems. *International Journal for Numerical Methods in Engineering* 119.10 (2019): 923-940

Parente, M. T., Mattis, S., Gupta, S., Deusner, C., and B. Wohlmuth. "Efficient parameter estimation for a methane hydrate model with active subspaces." *Computational Geosciences* 23.2 (2019): 355-372.

He, J., S. Mattis, T. Butler, and C. Dawson, "Data-driven uncertainty quantification for predictive flow and transport modeling using support vector machines." *Computational Geosciences* 23.4 (2019): 631-645.

Mattis, S., Kees, C., Wei, M., Dimakopoulos, A. and Dawson, C. "Computational model for wave attenuation by flexible vegetation." *Journal of Waterway, Port, Coastal and Ocean Engineering* 145.1 (2018): 04018033.

Mattis, Steven A., and Barbara Wohlmuth. "Goal-oriented adaptive surrogate construction for stochastic inversion." *Computer Methods in Applied Mechanics and Engineering* 339 (2018): 36-60.

Butler, T., L. Graham, S. Mattis, and S. Walsh "A measure-theoretic interpretation of sample based numerical integration with applications to inverse and prediction problems under uncertainty." *SIAM Journal on Scientific Computing*, 39.5 (2017): A2072-A2098.

Presho, M., S. Mattis, and C. Dawson. "Uncertainty quantification of two-phase flow problems via

measure theory and the generalized multiscale finite element method." *Computational Geosciences* 21.2 (2017): 187-204.

Mattis, Steven A., Troy D. Butler, Clint N. Dawson, Donald Estep, and Velimir V. Vesselinov. "Parameter estimation and prediction for groundwater contamination based on measure theory." *Water Resources Research* 51.9 (2015): 7608-7629.

Sund, Nicole, Diogo Bolster, Steven Mattis, and Clint Dawson. "Pre-asymptotic Transport Upscaling in Inertial and Unsteady Flows Through Porous Media." *Transport in Porous Media* (2015): 1-22.

Mattis, Steven A., Clint N. Dawson, Christopher E. Kees, and Matthew W. Farthing. "An immersed structure approach for fluid-vegetation interaction." *Advances in Water Resources* 80 (2015): 1-16.

Mattis, Steven A., Clint N. Dawson, Christopher E. Kees, and Matthew W. Farthing. "Numerical modeling of drag for flow through vegetated domains and porous structures." *Advances in Water Resources* 39 (2012): 44-59.

Backes, Tracy M., Russell Latterman, Stephen A. Small, Steven Mattis, Gwyn Pauley, Emily Reilly, and Sharon R. Lubkin. "Convergent extension by intercalation without mediolaterally fixed cell motion." *Journal of Theoretical Biology* 256, no. 2 (2009): 180-186

JOURNAL ARTICLES UNDER REVIEW

Mattis, Steven A. and Barbara Wohlmuth, "Reduced order modeling for problems with both smooth/affine and nonsmooth/monaffine parametric dependence." submitted

CONFERENCE PRESENTATIONS

Mattis, S. and Wohlmuth, B., "Accelerating Prediction under Uncertainty for Groundwater Problems." SIAM Conference on Mathematical and Computational Issues in the Geosciences, Houston, TX, March 2019

Mattis, S. and Wohlmuth, B., "Accelerating Prediction under Uncertainty with Dimension Reduction." SIAM Conference on Computational Science and Engineering, Spokane, WA, February 2019

Mattis, S. and Wohlmuth, B., "Goal-Oriented Adaptive Surrogate Construction for Efficient Predictions Under Uncertainty." 6th European Conference on Computational Mechanics and 7th European Conference on Computational Fluid Dynamics, Glasgow, United Kingdom, June 2018

Mattis, S. and Wohlmuth, B., "Goal-Oriented Surrogate Construction for Groundwater Problems." The XXII International Conference Computational Methods in Water Resources, Saint-Malo, France, June 2018

Mattis, S. and Wohlmuth, B., "Goal-oriented adaptive sampling for groundwater problems." SIAM Conference on Mathematical and Computational Issues in the Geosciences, Erlangen, Germany, September 2017

Mattis, S. "Measure-Theoretic Stochastic Inversion of Groundwater Problems." Frontiers of Uncertainty Quantification in Engineering (FrontUQ), Munich, Germany, September 2017

Mattis, S. and Butler, T, "Error Estimation and Adaptive Error Control in Measure-Theoretic Stochastic Inversion." SIAM Conference on Computational Science and Engineering, Atlanta, GA, March 2017

Mattis, S. and Graham, L., "BET: Software for Measure-Theoretic Stochastic Problems," The XXI International Conference Computational Methods in Water Resources, Toronto, Canada, June 2016

Mattis, S., Butler, T., and Dawson, C., "Error Estimation and Control for Stochastic Inversion of

Groundwater Contamination Problems," European Congress on Computational Methods in Applied Sciences and Engineering, Crete Island, Greece, June 2016

Mattis, S., Dawson, C., Butler, T., and Graham, L., "A Measure-Theoretic Approach to Parameter Estimation," SIAM Conference on Uncertainty Quantification, Lausanne, Switzerland, April 2016

Mattis, S., Dawson, C., and Butler, T., "Uncertainty Quantification for Groundwater Contamination Using Measure Theory." 13th U.S. National Congress on Computational Mechanics, San Diego, CA, July 2015

Mattis, S., Butler, T., Dawson, C., "Probabilistic Parameter Estimation and Prediction for Groundwater Contamination." SIAM Conference on Mathematical and Computational Issues in the Geosciences, Stanford, CA, June 2015

Mattis, S. and Graham, L., "BET: Applications for an Open Source Inverse Problems Package." SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015

Mattis, S., "Modeling Flow and Transport Through Idealized Coastal Vegetation." SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015

Mattis, S., Dawson, C., and Butler, T., "A Scalable Measure-Theoretic Approach to the Stochastic Inverse Problem for Groundwater Contamination." SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015

Mattis, S., Dawson, C., Butler, T. "UQ and Decision Making for Groundwater Contamination: A Measure-Theoretic Approach." AGU Fall Meeting, San Francisco, CA, December 2014

Mattis, S., Dawson, C., Butler, T., Estep, D. "Measure-Theoretic Uncertainty quantification and parameter estimation for groundwater contaminant transport." SIAM Annual Meeting, Chicago, IL, July 2014

Mattis, S., Dawson, C., Butler, T., Estep, D. "Uncertainty quantification and parameter estimation for groundwater contaminant transport." The XX. International Conference on Computational Methods in Water Resources, The University of Stuttgart, Germany, June 2014

Mattis S., Dawson, C., Kees, C. and Farthing, W., "Modeling Resistance Due to Flexible Vegetation." The 12th International workshop on Multi-scale (Un)-structured mesh numerical Modeling for coastal, shelf, and global ocean dynamics, Austin, TX, September 2013

Mattis S., Dawson, C., Kees, C. and Farthing, W., "An Immersed Boundary Method for Fluid-Vegetation Interaction." U.S. National Congress on Computational Mechanics, Raleigh, NC, July 2013

Mattis S., Dawson, C., Kees, C. and Farthing, W., "Numerical Modeling of Flow Over Flexible Vegetation." SIAM Conference on Mathematical and Computational Issues in the Geosciences, Padova, Italy, June 2013

Mattis S., Dawson, C., Kees, C. and Farthing, W., "Numerical Modeling of Flow Over Flexible Vegetation." SIAM Annual Meeting, Minneapolis, MN, July 2012

Mattis S., Dawson, C., Kees, C. and Farthing, W., "Modeling of Flow Through Porous Structures and Vegetated Regions." Computational Methods in Water Resources, Urbana-Champaign, IL, June 2012

Mattis S., Dawson, C., Kees, C. and Farthing, W., "Numerical Modeling of Flow Through Porous Structures and Vegetated Regions." SIAM Conference on Mathematical and Computational Issues in the Geosciences, Long Beach, CA, March 2011.

Mattis, S. and Dawson, C., "Homogenization and Darcy-Forchheimer flow through porous media."

Center for Subsurface Modeling Annual Affiliates Meeting, University of Texas at Austin, October 2009.

Mattis. S, "A Stochastic Mathematical Model for Cell Morphogenesis." American Mathematical Society/Mathematical Association of America Joint Meetings, Student Poster Session, San Diego, CA , January 2008.

INVITED TALKS

Mattis, S. "Measure-Theoretic Stochastic Inversion of Groundwater Contamination Problems," Simula Research Laboratory, Oslo, Norway, March, 2016

Mattis, S. "Measure-Theoretic parameter estimation and prediction for contaminant transport and coastal ocean modeling," Rocky Mountain Summer Workshop on Uncertainty Quantification, University of Colorado Denver, July, 2015

Mattis, S., "Modeling Flow and Transport Through Obstructed Regions," Center for Computational Mathematics, University of Colorado Denver, September, 2014

SESSIONS ORGANIZED

Co-Organizer, Minisymposium on Uncertainty Quantification in Subsurface Flow and Transport, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Houston, TX, March, 2019

Co-Organizer, Minisymposium on Discovering and Exploiting Low-dimensional Structures in Computational Models, SIAM Conference on Computational Science and Engineering, Spokane, WA, February, 2019

Co-Organizer, Minisymposium on Advances in uncertainty quantification methods for hydrological applications, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Erlangen, Germany, September 2017

Co-Organizer, Minisymposium on the Solution of Large-scale Inverse Problems, European Congress on Computational Methods in Applied Sciences and Engineering, Crete Island, Greece, June, 2016

Co-Organizer, Rocky Mountain Summer Workshop on Uncertainty Quantification, University of Colorado Denver, July, 2015

Co-Organizer, Minisymposium on Error Analysis and Scalability of UQ Methodologies for Inverse Problems, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March, 2015

COURSES TAUGHT

Fall 2014: ASE 211K, Engineering Computation, Department of Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin

Spring 2015: ASE 211K, Engineering Computation, Department of Aerospace Engineering and Engineering Mechanics, The University of Texas at Austin

SOFTWARE PROJECTS

BET: Butler, Estep, Tavener Method - A python based package for measure-theoretic stochastic inverse and forward problems. https://github.com/UT-CHG/BET

PROTEUS: A computational methods and simulation toolkit. https://github.com/erdc-cm/proteus