

Lindley C Graham

Postdoctoral Research Associate

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RESEARCH EXPERTISE

Uncertainty quantification, scientific computations with python, multifidelity Monte Carlo, stochastic inverse problems, parameter estimation, predictive modeling, scientific computing, fluid dynamics in shallow water systems

RESEARCH INTERESTS

Bayesian-based uncertainty quantification, exploiting cloud computing services for scientific computations, fluid dynamics in shallow water systems and aerospace systems, active subspaces for dimension reduction

EDUCATION

University of Texas at Austin, Austin, TX

Institute for Computational Engineering & Sciences

Advisor: Clint Dawson

M.S. in Computational Science, Engineering, and Mathematics, May 2012

Ph.D. in Computational Science, Engineering, and Mathematics, August 2015

Dissertation: *Adaptive Measure-Theoretic Parameter Estimation for Coastal Ocean Modeling*

<http://hdl.handle.net/2152/32435>

Massachusetts Institute of Technology, Cambridge, MA

B.S. in Aerospace Engineering, June 2010

OPEN SOURCE PROJECTS

Butler, Estep, Tavener (BET) Method - A Python package for measure-theoretic stochastic inverse and forward problems <https://github.com/UT-CHG/BET>.

PolyADCIRC - A Python package for running batches of parallel Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters (ADCIRC) simulations with varying parameters (Mannings n and limited variable bathymetry, etc) <https://github.com/UT-CHG/PolyADCIRC>.

SKILLS

- Languages: Python, MPI, MATLAB, Java, Real-Time Java, B_IT_EX, L_AT_EX, Fortran (limited experience), HTML (some experience)
- Applications: Git, Subversion, Eclipse, Mathematica, Microsoft Office, LibreOffice, EndNote

MEMBERSHIPS

National Postdoctoral Association (2015 - present)

Society for Industrial and Applied Mathematics (2010 - present) - Chapter Officer (2011 - 2013)

National Society of Black Engineers (2006 - 2015)

EXPERIENCE

Florida State University

Tallahassee, FL

Postdoctoral Research Associate

September 2015 - present

Supervisor: Max Gunzburger

Current research projects include adaptive and CVT based multifidelity Monte Carlo estimation and creating CVTs for climate science applications.

Referee for Scientific Communication class 2016 – Reviewed student technical paper, resume, CV, and conducted mock group interviews.

Aurora Flight Sciences – Research and Development

Cambridge, MA

Intern

June 2009 - August 2009

Created a suite of MATLAB scripts to model NO_x production using the ICAO engine emissions data

bank. Implemented a stochastic model of Global Hawk flight paths and integrated this model with legacy code from MIT Lincoln Laboratory to model manned aircraft and UAV encounters in the NAS. Assisted engineers with SBIRs concerning UAV operations in the NAS and balloon missions to Mars and Titan

NASA Space Grant – Jet Propulsion Laboratory

Pasadena, CA

Intern

June 2008 - August 2008

Worked on a six-person team to expand the mission concept design for a future Earth observing satellite culminating in a final report, multi-hour design review, and presentation to the JPL Executive Council. Reviewed literature about past and present NASA data processing centers and contacted industry engineers in order to formulate a recommendation for the mission data processing plan.

Massachusetts Institute of Technology – Humans and Automation Lab

Cambridge, MA

Undergraduate Research Opportunities Program

December 2007 - May 2008

Installation, operation and maintenance of eye and head tracking system. Conducted a brief literature review of eye tracking research. Compiled the HAL ISCAN Eye and Head Tracker Quick Start Manual, a comprehensive twenty five page guide to get researchers started with the equipment and tips on how to expand and adapt its utility for the future.

Undergraduate Practice Opportunities Program

Cambridge, MA

Participant

October 2007 - May 2008

Member of an eight-person team lead by a mentor with industry experience. Yearlong co curricular professional development course with workshops and seminars emphasizing leadership, interpersonal communication, data analysis, decision-making and product design.

Build It Yourself

Cambridge, MA

Workshop Leader and Web Caster

July 2007 - August 2007

Co-led various workshops of 12-19 children, ages 8 - 12. Fostered children's creativity and interests in robotics, web design, and video game design. Evaluated and augmented effectiveness of course ware.

PUBLICATIONS

L. Graham, T. Butler, S. Walsh, C. Dawson, and J. J. Westerink, A Measure-Theoretic Algorithm for Estimating Bottom Friction in a Coastal Inlet: Case Study of Bay St. Louis during Hurricane Gustav (2008), Monthly Weather Review, October 2016., in PRODUCTION, DOI: 10.1175/MWR-D-16-0149.1.

T. Butler, 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, February 2016, in REVIEW, <http://digital.auraria.edu/IR00000054/00001>.

T. Butler, L. Graham, D. Estep, C. Dawson, J.J. Westerink, Definition and solution of a stochastic inverse problem for the Manning's n parameter field in hydrodynamic models, Advances in Water Resources, Available online 3 February 2015, ISSN 0309-1708, <http://dx.doi.org/10.1016/j.advwatres.2015.01.011>.

Hartzell, C.M.; Graham, L.C.; Tao, T.S.; Goldberg, H.R.; Carpena-Nunez, J.; Racek, D.M.; Taylor, C.E.; Norton, C.D., "Data system design for a hyperspectral imaging mission concept," Aerospace conference, 2009 IEEE , vol., no., pp.1,21, 7-14 March 2009, DOI: 10.1109/AERO.2009.4839507.

PAPERS IN PREPARATION

T. Butler, D. Estep, S. Tavener, T. Wildey, C. Dawson, and L. Graham, "Solving stochastic inverse problems using sigma-algebras on contour maps," arXiv preprint arXiv:1407.3851, <http://arxiv.org/pdf/1407.3851>, 2014.

HONORS AND AWARDS

- University of Texas at Austin – Prestigious Fellowship Supplement (2013-2015)
- University of Texas at Austin – Prestigious Bruton Award (2012-2013)
- Extreme Science and Engineering Discovery Environment (XSEDE) Scholar (2012-2013)
- National Science Foundation Graduate Research Fellowship (2011-2015) Grant No. DGE-1110007
- University of Texas at Austin – Graduate School Diversity Recruitment Fellowship (2010)
- National Achievement Scholarship (2006 - 2010)
- Robert C. Byrd Scholarship (2006 - 2010)
- California Scholarship Federation, Seal Bearer (2006 - life)

SERVICE

- Volunteer FSU XSEDE Student Challenge Judge 2016
- Volunteer Judge for Capital Regional Science and Engineering Fair, February 2016
- Co-mentored visiting graduate student Scott Walsh during summer research, Austin, TX, Summer, 2015
- Member of organizing committee for the Rocky Mountain Summer Workshop on Uncertainty Quantification, <http://users.ices.utexas.edu/~steven/rocky-mtn-summer-workshop-2015/>, Denver, CO, July 2015

PRESENTATIONS

- Measure-Theoretic Methods for Uncertainty Quantification*, L. Graham, Applied Mathematics Colloquium, Columbia University, New York, NY, November 2016
- Measure-Theoretic Augmentation of Multifidelity Monte-Carlo Estimation*, L. Graham and M. Gunzburger, SIAM Annual Meeting, Boston, MA, July 2016
- BET: Software for Measure-Theoretic Stochastic Problems* (Poster), **S. Mattis** and L. Graham, CMWR 2016, Toronto, Canada, June 2016
- Measure-Theoretic Parameter Estimation for Hurricane Storm Surge*, L. Graham, C. Dawson, and T. Butler, ECCOMAS, Crete Island, Greece, June 2016
- Measure-Theoretic Parameter Estimation for Hydrodynamic Models*, L. Graham, 13th U.S. National Congress on Computational Mechanics, San Diego, CA, July 2015
- Adaptive Measure-Theoretic Parameter Estimations for Coastal Ocean Modeling*, L. Graham, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Stanford, CA, June 2015
- Adaptive Measure-Theoretic Parameter Estimations for Coastal Ocean Modeling*, L. Graham, University of Notre Dame, South Bend, IL, May 2015
- Adaptive Measure-Theoretic Inverse Techniques for High Dimensional Parameter Domains and Complex Multi-Scale Models*, L. Graham, ICES Student Forum, Austin, TX, April 2015
- Adaptive Measure-Theoretic Inverse Techniques for High Dimensional Parameter Domains and Complex Multi-Scale Models*, L. Graham, C. Dawson, T. Butler, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015
- BET: Applications for an Open Source Inverse Problems Package* (Poster), L. Graham, S. A. Mattis, C. Dawson, T. Butler, SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015
- Parameter Estimation within the Advanced Circulation (ADCIRC) Model: A Computational Framework* (Poster), L. Graham, C. Dawson, T. Butler, D. Estep, J. Westerink, ICERM workshop on Challenges in 21st Century Experimental Mathematical Computation (received travel funding), Providence, RI, July 2014
- Spatially Heterogeneous Parameter Estimation Within the Advanced Circulation (ADCIRC) Model*, L. Graham, C. Dawson, T. Butler, J. Westerink, and D. Estep, SIAM Annual Meeting (UT Austin – Professional Development Award Funding), Chicago, IL, July 2014
- Stochastic Inverse Problems for Storm Surge*, ICERT REU Computational Applications Seminar, Austin, TX, June 2014
- Inverse Sensitivity Analysis for Storm Surge Models* (Poster), L. Graham, C. Dawson, D. Estep, J. Westerink, and T. Butler, SIAM Conference on Computational Science and Engineering, Boston, MA, February 2013
- Inverse Sensitivity Analysis for Storm Surge Models*, XSEDE Scholars Program Webinar Series, Online, January 2013

NSBE Graduate Student Panel, University of Texas at Austin NSBE Chapter Meeting, Austin, TX, October 2012

WORKSHOPS AND
CONFERENCES

Co-organized minisymposia *Monte Carlo and ensemble methods for Uncertainty Quantification* with Nan Jiang, Atlanta, GA, February 2017

Co-organized minisymposia *Computational Science and Statistics for Complex Models (part of the Workshop Celebrating Diversity)* for SIAM Annual Meeting (SIAM funding), Boston, MA, July 2016

Co-organized minisymposia *MS 1013- Solution of large-scale inverse problems* for European Congress on Computational Methods in Applied Sciences and Engineering, Crete Island, Greece, June 2016

13th U.S. National Congress on Computational Mechanics (received travel funding), San Diego, CA, July 2015

SIAM Conference on Mathematical and Computational Issues in the Geosciences, Stanford, CA, June 2015

SIAM Conference on Computational Science and Engineering, Salt Lake City, UT, March 2015

ICERM workshop on Challenges in 21st Century Experimental Mathematical Computation (received travel funding), Providence, RI July 2014

International workshop on Multi-scale (Un)-structured mesh numerical Modeling for coastal, shelf, and global ocean dynamics, Austin, TX, September 2013

Uncertainty Quantification Summer School, Los Angeles, CA, August 2012

Gene Golub SIAM Summer School (received travel funding), Monterey, CA, August 2012

XSEDE12: Bridging from the eXtreme to the campus and beyond (received travel funding), Chicago, IL, July 2012

SIAM Conference on Uncertainty Quantification, Raleigh, NC, April 2012

Uncertainty Quantification for Complex Systems, Austin, TX, October 2011