1021 Dulaney Valley Road Center for Data, Mathematical, and Computational Sciences

Baltimore, MD 21204 Goucher College, Julia Rogers 141

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**EDUCATION**

CLEMSON UNIVERSITY Clemson, SC

Doctor of Philosophy, Mathematical Sciences *May 2016*

Dissertation: *Hyperspectral Diffuse Optical Tomography Using the Reduced Basis Method and Sparsity Constraints*

Advisor: Dr. Taufiquar Khan

Master of Science, Mathematical Sciences *August 2011*

Master’s Thesis: Physical Process Models as Regularization Constraints on Geophysical Imaging Problems

Advisors: Dr. Taufiquar Khan, Dr. Stephen Moysey (Department of Environmental Engineering & Earth Sciences)

Diplôme de français professionnel- Affaires B2 *July 2012*

Certification in business French awarded by the Chamber of Commerce and Industry in Paris. Passed with high honors (“mention très bien”).

DENISON UNIVERSITY Granville, OH

Bachelor of Arts, Majors: Mathematics, French *May 2008*

Suma Cum Laude, Phi Beta Kappa

Honor’s Thesis: Knots in Straight-Edge Embeddings of K7

Advisor: Dr. Lewis Ludwig

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**RESEARCH INTERESTS**

Medical image reconstruction (particularly diffuse optical tomography and hyperspectral imaging), signal processing, reduced basis method for PDEs, nonlinear inverse problems involving PDEs, sparsity regularization, natural languages

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**PUBLICATIONS**

**Published:**

N. Durgin, **R. Grotheer**, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin. "Sparse randomized Kaczmarz for support recovery of jointly sparse corrupted multiple measurement vectors." *Research in Data Science*. Springer, Cham, 2019. 1-14.

N. Durgin, **R. Grotheer**, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin. “Compressed anomaly detection with multiple mixed observations.” *Research in Data Science*. Springer, Cham, 2019. 211-237.

S.C. Gray, T. Massaro, I. Chen, C. Edholm, **R. Grotheer**, Y. Zheng, and H. Chang. “A county-level analysis of persons living with HIV in the southern United States.” *AIDS care* 28.2 (2016): 266-272..

T. Khan, J. Reneke, **R. Grotheer** and T. Strauss. "Decision making using a multi-criteria approach in a wholesale electrical power market." *Power Systems Conference (PSC), 2015 Clemson University*. IEEE, 2015.

B.H. Hokr, C.D. Clark, III, **R. E. Grotheer**, and R.J. Thomas. “Higher-order wide-angle split-step spectral method for non-paraxial beam propagation.” Optics Express 21, 15815-15825, 2013.

**Accepted:**

N. Durgin, **R. Grotheer**, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin**.** “Fast Hyperspectral Diffuse Optical Imaging Method with Joint Sparsity”. *Proceedings of the 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society.*

N. Durgin, **R. Grotheer**, C. Huang, S. Li, A. Ma, D. Needell, and J. Qin. “Jointly Sparse MMV Signal Recovery with Prior Information.” *Proceedings of the 2019 Asilomar Conference on Signals, Systems, and Computers.*

**Submitted:**

**R. Grotheer,** S. Li, A. Ma, D. Needell, and J. Qin. “Iterative Hard Thresholding for Low CP-rank Tensor Models.” arXiv preprint arXiv:1908.08479

**R. Grotheer**, T. Strauss, P. Gralla, and T. Khan. “Alternatives to the Greedy Approach for Generating a Basis in the Reduced Basis Method.” arXiv:1803.00948

J. Qin, S. Li, D. Needell, A. Ma, **R. Grotheer**, C. Huang, and N. Durgin. "Stochastic Greedy Algorithms For Multiple Measurement Vectors". arXiv:1711.01521

**In Progress:**

**R. Grotheer,** S. Li, A. Ma, D. Needell, and J. Qin. “Stochastic Iterative Hard Thresholding for Low-Tucker-Rank Tensor Recovery.” To be submitted shortly*.*

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**CONFERENCE PRESENTATIONS**

**International Conference of the IEEE Engineering in Medicine and Biology Society** *July 2019*

Ignite Session speaker, and poster presentation: “Fast Hyperspectral Diffuse Optical Imaging Method with Joint Sparsity.”

**ACMS Biennial Meeting** *May 2019*

Contributed talk: “Paradigm Shift: One College’s Transition from Math to Data Analytics.”

**MAA MD-DC-VA Sectional Meeting** *April 2019*

Contributed talk: “Streaming isn’t Just for Netflix: How to Deal with Corrupt Signals in Medical Imaging.”

**AMS Spring Central and Western Joint Sectional Meeting** *March 2019*

Special Session, *Sparsity, Randomness, and Optimization* (invited by organizers): “Application of Stochastic Algorithms for Multiple Measurement Vectors to the Hyperspectral Diffuse Optical Tomography Problem.”

**Joint Mathematics Meetings** *January 2019*

Special Session, *Statistical, Variational, and Learning Techniques in Image Analysis and their Applications to Biomedical, Hyperspectral, and Other Imaging*: “Application of Stochastic Algorithms for Multiple Measurement Vectors to the Hyperspectral Diffuse Optical Tomography Problem.”

Special Session, *Inquiry-Based Learning and Teaching*: “A 1st and A 10^1st IBL class: Transformation and Shared Struggle.”

**MAA MathFest** *August 2018*

Special Session, *Priming the Calculus Pump: Fresh Approaches to Teaching First-Year Calculus*: “Calculus in the Real World: Increasing Relevancy Through Data and Modeling”

**Joint Mathematics Meetings** *January 2018*

Special Session, *Quantitative Literacy Across the Curriculum*: “Data Analytics Across the Curriculum: Rethinking Quantitative Literacy at Goucher College”

**MAA MathFest** *August 2017*

Session co-organizer: “Where are the Math Majors? Broadening Scope by Increasing Mathematics Enrollment”

Contributed Paper Session on Applied Mathematics: “Reconstructing the Chesire Cat in Technicolor: The Problem of Hyperspectral Medical Imaging”

*Also served as faculty mentor for graduate student in the “What’s the Story?” Session (listened to graduate student present a talk aimed at an undergraduate audience and gave feedback one-on-one to the student afterwards).*

**ACMS Biennial Meeting** *May 2017*

Contributed Talk: “Living at Work: My First Year as a Faculty-in-Residence”

**OTHER PRESENTATIONS**

**Hood College, Math Seminar** *October 2017*

*“Can you Reconstruct a Tiger from its Stripes? The Mathematical Reconstruction of a Medical Image”*

**Stevenson University STEMinar Series** *February 2017*

*“Can you Reconstruct a Tiger from its Stripes? The Mathematical Reconstruction of a Medical Image”*

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**TEACHING EXPERIENCE**

GOUCHER COLLEGE Baltimore, MD

**Assistant Professor** *Fall 2016-Present*

MA 497, Senior Capstone Research – Medical Imaging (2 students), Wavelets (1 student), Knot/Graph Theory (1 student)

MA 416, Scientific Computation (2 semesters)

MA 304, Proof Writing Seminar (3 semesters)

MA 231, Differential Equations with Applications (1 semester)

MA 216, Topics in Applied Math: Operations Research (1 semester)

MA 180, Calculus of One Variable II (2 semesters)

MA 172, Calculus Through Data and Modeling (5 semesters)

MA 170, Calculus of One Variable I (1 semester)

MA 160, Precalculus (2 semesters)

CLEMSON UNIVERSITY Clemson, SC

**Graduate Teacher of Record** *Fall 2010-Spring 2016*

MATH 3090, Statistics for Science and Engineering (1 semester)

MATH 1080, Calculus of One Variable II (3 semesters)

MATH 1060, Calculus of One Variable I (2 semesters)

MATH 1050, Precalculus (1 semester)

MATH 1010, Essential Mathematics for the Informed Society (1 semester)

**Graduate Teaching Assistant** *Fall 2009- Spring 2010*

MATH 1010, Essential Mathematics for the Informed Society (online, 1 summer session)

MATH 1030, Elementary Functions (1 semester)

MATH 1060, Calculus of One Variable I (online, 1 summer session)

MATH 1070, Differential and Integral Calculus (second semester of Calculus of One Variable I) (2 summer sessions)

Lab Instructor for MATH 1990, Problem Solving in Mathematics (College Algebra) (1 semester)

**Teaching Assistant and Course Developer (MATH 9000)** *Spring 2015- Spring 2016*

Asked by department Graduate Coordinator to develop and teach a class for international graduate students in the department to help them practice conversational English in order to pass the required English speaking test (so that they may be instructors). Assigned and offered feedback on oral presentations, gave short grammar/vocabulary lessons, facilitated discussions on variety of topics and games.

**Guest Lecturer** *Summer 2015*

MATH4120, Algebra I (undergraduate course): Grader, guest lecturer (1 class session)

MATH 4540, Advanced Calculus II (undergraduate course): guest lecturer (3 class sessions – covered Sections 6.4 and 6.5 in Stoll’s “Real Analysis”)

**Private Tutoring** *Fall 2009-Fall 2015*

Tutored undergraduate students one-on-one, for 1 to 3 hours a week in Quantitative Reasoning, and Calculus sequence classes.

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**PROFESSIONAL EXPERIENCE**

**Faculty-in-Residence** **Goucher College**

 August 2016 – August 2019

Sole Faculty-in-Residence for pilot program in new first-year dorm. Developing program through creating dorm activities and interacting with students outside of the classroom by attending concerts, sporting events, and joining them for meals in the dining hall, as well as holding “community hours” in the dorm, non-academic office hours where students can ask questions or chat.

**Women in Data Science and Mathematics (WiSDM) Research Collaboration ICERM**

**Participant** July 2019

Held at the Institute for Computational and Experimental Research in Mathematics (ICERM), the WiSDM Workshop brought together women in academia and industry to collaborate on research projects related to data science. On a team of seven working on problems in applying tensor-based algorithms to feature extraction and gene expression problems. Team lead: Misha Kilmer, Tufts University

**MSRI Summer Research for Women in Mathematics (SWiM) MSRI**

**Participant** June 2019

Two-week research collaboration at the Mathematical Sciences Research Institute (MSRI). Studied tensors and tensor decompositions with four other collaborators. Meeting resulted in submission of two papers so far.

**Collaborate@ICERM ICERM**

**Particpant** August 2018

One-week research collaboration at the Institute for Computational and Experimental Research in Mathematics (ICERM). Continued work with collaborators from the Women in Data Science and Mathematics Research Collaboration (see below) on developing stochastic algorithms for signal processing.

**MAA Project NExT**

**Participant (Green’16 cohort)** August 2016-August 2017

Professional development program (NExT stands for “New Experiences in Teaching”) for new or recent PhDs in the mathematical sciences run by the Mathematical Association of America (MAA). Workshops at three national conferences throughout the year, several organized and run by particpants, addressing a variety of issues related to teaching, scholarship, service, and life in academia. Participants also paired with a mentor.

**MAA Section NExT**

**Participant** November 2016-March 2018

Professional development program (NExT stands for “New Experiences in Teaching”) for new or recent PhDs in the mathematical sciences run by the Maryland-DC-Virginia Section of the Mathematical Association of America (MAA). Workshops at two regional conferences throughout the year, several organized and run by participants, addressing a variety of issues related to teaching, scholarship, service, and life in academia.

**Women in Data Science and Mathematics (WiSDM) Research Collaboration ICERM**

**Participant** July 2017

Held at the Institute for Computational and Experimental Research in Mathematics (ICERM), the WiSDM Workshop brought together women in academia and industry to collaborate on research projects related to data science. On a team of seven working on problems in signal processing (multiple measurement vectors and compressed sensing). Team lead: Deanna Needell, UCLA

**Graduate Student Mathematical Modeling (GSMM) Camp Rensselaer Polytechnic Institute**

**Participant** June 2015

Four day workshop to work on problems in teams given by faculty and industry mentors inspired by real industrial problems. Project: “In Vivo Delivery of Gene Therapy to Tumors”. Mentor: Dr. Ian Griffiths, Oxford University

**Mathematical Problems in Industry (MPI) Workshop University of Delaware**

**Participant** June 2015

Five day workshop solving real industry problems in small groups of graduate students, faculty and scientists in industry. Volunteered to present results to large group. A written report also given to industry representatives. Project: “Desulfurization of Natural Gas for Fuel Cells”, Industry Partner: Bloom Energy

**Pre-Conference Professional Development Workshop Redeemer University College, Canada**

**Participant** May 2015

Workshop for early faculty and graduate students near the end of their degree, offered by the Association for Christians in the Mathematical Sciences (ACMS) before their biennial conference. Focused on preparation for life as a faculty member, application for academic jobs, and scholarly writing. Also received mentoring by senior faculty mentor, and structured time for academic writing.

**Graduate Student Career Development Workshop UNC-Wilmington**

**Participant** March 2015

A one-day event at the meeting of the Southeastern Section of the MAA. Information about a career in academia, in industry, and application advice from faculty given in the morning, critiqued presentation delivered in afternoon.

**SAMSI Industrial Math/Stat Modeling Workshop for Graduate Students (IMSM) NC State University**

**Participant** July 2014

Worked on a team of graduate students to study the HIV prevalence in the U.S. South and the socioeconomic factors that affect it using linear and geography-based statistical regression analysis as well as cluster analysis. As a result of the ten-day workshop, the team wrote a 20-page report, which was revised and submitted for publication, as well as delivered a 20-minute presentation to the other participants and mentors. Mentored by a faculty member in Biostatistics at Emory University (Dr. Howard Chang) and a representative from the Centers for Disease Control and Prevention (Dr. Simone Gray).

**TASC, Inc.** **San Antonio, TX**

**Intern** August - December 2012

Worked with the U.S. Air Force Research Laboratory. Contributed to a paper, “Higher-order wide-angle split-step spectral method for non-paraxial beam propagation”, and continued research started by previous interns in the optimization of near infrared laser beam propagation through the eye.

**Zentrum für Technomathematik, Universität BremenBremen, Germany**

**Visiting Scholar** Summer 2010

Studied the theoretical background of inverse problems and regularization techniques specifically relating to imaging applications under the supervision of a PhD student. Funded through Clemson-Bremen Exchange Program.

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**HONORS AND AWARDS**

**Outstanding Citizenship Award** May 2012, 2013, 2015

Awarded to 2-5 graduate students in the Department of Mathematical Sciences each spring for exceptional service to the department. Received for volunteering often to meet with prospective students and helping with the prospective student weekend by giving campus tours, serving on panels and eating lunch with prospective students (2012), for co-founding the student chapter of the Association for Women in Mathematics (2013), and for developing the English conversation course for international students (2015- only recipient of the award this year).

**Awarded Fulbright Teaching Fellowship (France)** April 2008

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**FUNDING**

**Summer Research for Women in Mathematics (SWiM) at MSRI** *Summer 2019*

**Collaborate@ICERM program** *Summer 2018*

**Crosby Grant (for development of MA 172– Goucher College)** *Winter 2016-2017*

**American Mathematical Society Grad Student Travel Grant (JMM)** *Winter 2016*

**Mathematical Association of America Student Travel Grant (MathFest)** *Summer 2015*

**Association of Christians in the Mathematical Sciences Student Travel Grant** *Summer 2015*

**Professional Enrichment Grant (Clemson University) – 4 awarded** *Spring 2015,2016*

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**AFFILIATIONS**

1. Society for Industrial and Applied Mathematics (SIAM)
2. Mathematical Association of America (MAA)
3. American Mathematical Society (AMS)
4. Association for Women in Mathematics (AWM)
5. Association of Christians in the Mathematical Sciences (ACMS)
6. Phi Beta Kappa

 Omicron Delta Kappa

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**ACTIVITIES**

**Math and Computer Science (MACS) Club Advisor** *Fall 2016-Present*

**Pi Mu Epsilon, Mathematics Honorary Society Advisor** *Fall 2017 – Present*

**Association for Women in Mathematics- Goucher Chapter** *Spring 2018 – Present*

Faculty Advisor, co-founder

**SIMIODE Challenge Using Differential Equations Modeling, Team Coach** *Spring 2018*

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**SERVICE**

**Academic Policies Committee** *Present*

**Faculty-in-Residence** *Fall 2016 – Spring 2019*

**Faculty Representative to Board of Trustee’s Committee for Campus Life** *Fall 2018 – Spring 2019*

**Community Principles Review Team** *Spring 2018*

**Undergraduate Poster Session Judge – Joint Mathematics Meetings** *Spring 2017, 2018*

**Referee for** *College Mathematics Journal* *Fall 2016 - Present*

**“Goucher Bound”, Admitted Student Event, Faculty Representative** *Spring 2017. 2018*

**Move-In Day Volunteer** *Fall 2016, 2017, 2018, 2019*

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**SKILLS**

1. Programming Languages: MATLAB, Python, Sage, R
2. Natural Languages: English (native), French (fluent), Spanish (beginner)
3. Computer Proficiencies: LaTeX, Mac OS, Windows

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