

Program in Applied Mathematics
University of Arizona
617 N. Santa Rita Ave.
Tucson, Arizona 85721

Phone: (206) 818-9695
Office: Mathematics 702
Email: nhenscheid@math.arizona.edu
Website: <http://math.arizona.edu/~nhenscheid>

Education

Ph.D. Applied Mathematics, University of Arizona, December 2017 (anticipated).

Dissertation title: Quantifying Uncertainties in Predictive Medicine with Emission Imaging Systems.

Dissertation committee: Harrison Barrett (chair), Eric Clarkson, Leonid Kunyansky, Joseph Watkins.

M.S. Mathematics, Western Washington University, June 2012.

Project Title: The Geometrical Characterization of Optimal Transportation Maps for Convex Cost

Advisor: Tilmann Glimm

B.S. Applied Mathematics *With Distinction*, Western Washington University, August 2010.

Research Interests

My research focuses on applying mathematical, statistical, and computational methods to the problem of quantifying uncertainties in medical decision making, particularly as associated with the use of imaging data in personalized, predictive models of cancer therapy. This work involves the study of spatiotemporal uncertainty using random fields, novel mathematical models of emission imaging systems, biomathematical models of drug delivery and treatment efficacy, and statistical measures of uncertainty. I am additionally interested in inverse problems, optimization, statistical decision theory, machine learning and high dimensional data analysis, signal and image processing, scientific computing, sparsity, and applied harmonic analysis.

Employment

Graduate Research Associate, Center for Gamma Ray Imaging, University of Arizona, 6/15-present.

Graduate Teaching Assistant, Department of Mathematics, University of Arizona, 8/12-5/15.

High Energy Density Physics Intern, Lawrence Livermore National Laboratory, 6/14-8/14.

Graduate Teaching Assistant, Mathematics Department, Western Washington University, 9/10-6/12.

NASA-USRP Undergraduate Research Intern, Caltech Jet Propulsion Laboratory, 1/10-5/10.

Refereed Publications

Glimm, T. and Henscheid, N. (2013). "Iterative scheme for solving optimal transportation problems arising in reflector design", *ISRN Applied Mathematics*, vol. 2013, Article ID 635263

Publications in Progress

Harrison H. Barrett, Kyle J. Myers, Eric Clarkson, and Nick Henscheid. Physiological random processes in precision cancer therapy. To be submitted to PLoS ONE, 2017

Nick Henscheid. Constructing patient-specific physiological texture phantoms for use in personalized cancer therapy. Abstract accepted to 6th International Workshop on Computational Human Phantoms, paper to be submitted to Physics in Medicine and Biology, 2017

Nick Henscheid. Monte carlo methods for estimating uncertainties in treatment efficacy in precision cancer therapy. To be submitted to SIAM J. Uncertainty Quantification, 2017

Nick Henscheid, Abhinav K. Jha, and Harrison H. Barrett. Evaluation of photon processing detectors using the Fourier crosstalk matrix. Abstract submitted to IEEE MIC 2017, paper to be submitted to IEEE J. Medical Imaging, 2017

Nick Henscheid and Bin Dong. 3D cone beam CT reconstruction via simultaneous wavelet frame regularization and PDE constrained view interpolation. To be submitted to Physics in Medicine and Biology, 2017

Nick Henscheid. Effect of undersampling on task performance in sparsity regularized CT reconstruction. To be submitted to SIAM J. Imaging Sciences, 2017

Nick Henscheid. Mathematical aspects of photon processing imaging systems. To be submitted to SIAM J. Imaging Sciences, 2018

Invited Conference and Workshop Talks

CIMAT-UA Workshop, March 2017. “Constructing Task-Specific Random Field Models”.

Mathematics Colloquium, Western Washington University, November 2016. “Quantifying Uncertainties in Image Science”.

SIAM Conference on Imaging Science, May 2016. “Task-based Image Quality Assessment of Sparse Reconstruction Methods in Cone-Beam CT”.

Inverse Problems Seminar, University of Washington, March 2015. “Wavelet Frame Based Numerical Analysis of Inverse Problems”.

Mathematics Colloquium, Western Washington University, May 2014.

Contributed Talks, Departmental Talks and Posters

IEEE Medical Imaging Conference, October 2017. “Comparison of the Fourier Crosstalk Matrix for Photon Counting and Photon Processing Detectors”.

6th International Workshop on Computational Human Phantoms, August 2017. “Constructing patient-specific physiological texture phantoms for use in personalized cancer therapy”.

University of Arizona Quantitative Biology Colloquium, March 2017. “Random Field Models in Precision Cancer Therapy”.

Gordon Conference on Image Science, June 2016. “Physiological Random Fields via Infinite Dimensional Maximum Entropy” (Poster).

University of Arizona Uncertainty Quantification Seminar, March 2016. “Uncertainty Quantification in Medical Imaging”.

University of Arizona Modeling and Computation Seminar, December 2014. “Implementation of the Reference Jacobian Mesh Optimization Method in KULL”.

Lawrence Livermore National Laboratory Intern Poster Session, August 2014. “Implementation of the Reference Jacobian Mesh Optimization Method in KULL”.

International Congress of Industrial and Applied Mathematics 2011. “Numerical Methods for Optimal Transport Problems Arising in Reflector Design” (Poster).

Honors, Awards, & Fellowships

2016-2017 ARCS Scholar Award recipient.

2016 Galileo Circle Award recipient.

2014 Lawrence Livermore National Laboratory intern poster session ‘best poster’ award.

WWU Richard Greene Graduate Scholarship, 2011 and 2012.

2010-2011 WWU Elias A. Bond Graduate Fellowship.

Professional Activities and Service

Reviewer for *Journal of Machine Learning Research*.

Website redesign consultant for Program in Applied Mathematics, 2016.

Program in Applied Mathematics Graduate Representative, 2014-2015.

Program in Applied Mathematics Brown Bag Seminar coordinator, 2013-2014.

Student Member, American Mathematical Society 2010-present.

Student Member, Society of Industrial and Applied Mathematics 2010-present.

Top 5% contributor to Q&A site math.stackexchange.com.

Conferences and Workshops Attended

Center for Gamma Ray Imaging Small Animal Imaging Workshop, Jan 10-14, 2016, Tucson, Arizona.

Applied Inverse Problems Summer School and Conference, May 15-30, 2015, Helsinki, Finland.

Inverse Problems Conference in honor of Gunther Uhlmann, June 18-22, 2012, Irvine, CA.

IPDE Summer School, University of Washington, Summer 2011.

ICIAM 2011, July 18-22, 2011, Vancouver, British Columbia.

Mathematical Biology Workshop and IGTC Summit, July 14-16, 2011, Victoria, British Columbia.

Teaching

As a graduate teaching assistant at WWU and UA, I have been responsible for teaching full lecture courses with 30-35 students. This includes planning material and lecturing, writing, administering and grading assessments, meeting with course supervisors, and holding office hours.

University of Arizona

Math 527 Principles of Analysis, Fall 2014 - Spring 2017 (TA).

Program in Applied Mathematics graduate qualifying exam review, Summer 2015, 2016 and 2017.

Math 263 Statistics and Biostatistics, Spring 2015.

Math 122B Calculus I, Spring 2014 and Fall 2014.

Math 120R Precalculus, Fall 2013.

Math 323, Formal Reasoning and Writing, Spring 2013 (TA).

Math 111 Trigonometry, Fall 2012 and Spring 2013.

Western Washington University

Math 157 Business Calculus, Spring 2012.

Math 115 Pre-calculus II, Spring 2011, Winter 2012.

Math 114 Pre-calculus I, Winter 2011, Fall 2011.

Math 112 Functions and Algebraic Methods, Fall 2010.

Software Expertise

Expert user of MATLAB, Mathematica, \LaTeX , HTML, CSS, Javascript, C/C++, Python, CUDA, UNIX and Linux systems.

Proficient user of Fortran, Java, Git, GNU Make, R, Drupal.