Paul A. Kuberry

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EDUCATION

Clemson University, Clemson, SC — August 2010 - Present

- **Doctor of Philosophy** in Mathematical Sciences, Anticipated May 2015 — GPA: 4.0

  Dissertation: *Decoupling Fluid-Structure Interaction Problems,*
  with Hyesuk K. Lee

- **Masters** in Mathematical Sciences, May 2012 — GPA: 4.0

  Master' s Project: *Genetic Algorithm and Nelder-Mead Hybrid*
  with Eleanor Jenkins

Clarion University of Pennsylvania, Clarion, PA — August 2003 - May 2010

- **Bachelor of Science** in Mathematics, Honors Program, May 2010 — GPA: 3.79

ACCOMPLISHMENTS

Research Papers

- *Convergence of a fluid-structure interaction problem decoupled by a Neumann control over a single time-step,*

  P. Kuberry, H. Lee, submitted. (2014).

- *Analysis of a fluid-structure interaction problem recast in an optimal control setting,*

  P. Kuberry, H. Lee, submitted. (2014).

- *A decoupling algorithm for fluid-structure interaction problems based on optimization,*

  P. Kuberry, H. Lee,
  Computer Methods in Applied Mechanics and Engineering, 267 (2013) 594-605. doi: 10.1016/j.cma.2013.10.006

- *Some new analysis results for a class of interface problems,*

  Z. Li, L. Wang, E. Aspinwall, R. Cooper, **P. Kuberry**, A. Sanders, and K. Zeng,
  Mathematical Methods in the Applied Sciences, (2013). doi: 10.1002/mma.2865

- *Numerical approximation of the Voigt regularization for incompressible Navier-Stokes and magnetohydrodynamic flows,*

  P. Kuberry, A. Larios, L. Rebholz, and N. Wilson,
  Computers & Mathematics with Applications, 64(8) (2012) 2647-2662. doi: 10.1016/j.camwa.2012.07.010

Talks and Presentations

- Using Intrelab to quickly prototype interface algorithms,
  Invited talk at the 2014 Trilinos User Group meeting, Albuquerque, NM. — October 2014

- An optimization-based approach to decouple Fluid-Structure Interaction,
  Contributed talk the 2014 Finite Element Circus, Minneapolis, MN. — October 2014

- Fluid-Structure Interaction Decoupling by Optimization,
  Invited talk at the 2014 SIAM Annual Conference, Chicago, IL. — July 2014

- Analysis of a time-dependent fluid-structure interaction problem
  in an optimal control framework over a single time-step,
  Contributed talk at the 2014 SIAM Student Conference, Blacksburg, VA. — March 2014
  Invited talk at the 2014 SIAM-SEAS Annual Meeting, Melbourne, FL. — March 2014

- A Navier-Stokes–linear elastic FSI problem decoupled by means of optimization, — October 2013
  Contributed talk at the 2013 Finite Element Circus, Newark, DE.

- A decoupling algorithm for fluid-structure interaction problems based on optimization,
  Invited talk at the 2013 SIAM-SEAS Annual Meeting, Knoxville, TN. March 2013
  Contributed talk at the 2013 SIAM Student Conference, Clemson, SC. February 2013
  Invited talk at the Graduate Student Seminar, Clemson, SC. January 2013
- Genetic Algorithm and Nelder-Mead Hybrid, October 2012
  Master's Defense, Clemson University, Clemson, SC.
- Numerical and Theoretical Analysis for Interface Problems, July 2010
  NCSU REU/REG poster presentation, Raleigh, NC.
- Shortest Distance Algorithm Applied to Tiled Maps, May 2010
  Senior honors program presentation, Clarion, PA.
- Patterns in Cantors Matrix: Predicting reducibility and factorization using prime diagonals, February 2010
  Contributed talk at the 2010 YSU Student Mathematics Conference, Youngstown, OH.

Conferences

- SIAM Annual Conference, Chicago, IL July 2014
- SIAM-SEAS, Melbourne, FL March 2014
- SIAM Student Conference, Blacksburg, VA March 2014
- Finite Element Circus, Newark, DE October 2013
- SIAM-SEAS, Knoxville, TN March 2013
- SIAM Student Conference, Clemson, SC February 2013
- NCSU Summer REU/REG Poster Session, Raleigh, NC July 2010
- Youngstown State University Student Mathematics Conference February 2010

Honors and Awards

- SIAM Student Chapter Certificate of Recognition 2014
- Three Minute Thesis (3MT) finalist 2014
- Michael Case Award for promise in Graduate Research 2012
- Outstanding Master's Student Award 2012
- France Allison Scholarship for Professional Advancement 2010
- Meritorious Award in COMAP Mathematics Contest in Modeling 2009
- E.T.S. Excellence Award for Mathematics Content Knowledge 2009
- Foundation Leadership Scholarship 2009
- Foundation Honors Scholarship 2009
- U.S. Academic Scholarship 2003
- University Scholars Award 2003

TECHNOLOGY

Python	FreeFEM++	Eclipse
C++	LaTeX	VI/VIM
MATLAB	HTML, CSS, Javascript	Linux
Deal.II	Git/SVN	R

WORK EXPERIENCE

Sandia National Laboratories, Albuquerque, NM May 2014 - Present

- Year-Round Student Intern - Technical

  Work with Pavel Bochev on developing numerical schemes to accurately communicate fluxes across mismatched interfaces, while conserving physical properties such as linear momentum. Implement new algorithms in C++ into production code owned by Sandia National Laboratories for interface communication between two software packages.

Clemson University, Clemson, SC August 2010 - May 2014

- Graduate Research Assistant

  Worked under Hyesuk K. Lee on an NSF grant performing research related to stably and efficiently decoupling fluid-structure interaction problems. Disseminated research findings by preparing articles for publication and presenting at conferences.

- Graduate Teacher of Record

  Taught undergraduate calculus based mathematics courses designed for business majors. Created learning activities, quizzes, and collaborated with instructors of other course sections to prepare exam questions. Tutored students seeking help in my course and instructed six classes per week while still completing my own graduate course load.

- Graduate Teaching Assistant and Grader

  Graded numerical methods for engineers and linear algebra in addition to grading for calculus based undergraduate mathematics courses. Instructed several classes of linear algebra and calculus as the grader for these classes. Proctored for exams, graded homework, and provided constructive feedback to students to help them improve.

Naval Research Laboratory, Washington, DC May 2013 - August 2013

- Naval Research Enterprise Intern

  Investigated reduction techniques for simulating energetic materials. Computational complexity was decreased by targeting and removing unimportant chemical reactions and reactants from the chemical kinetics model. After researching many combustion kinetics reduction techniques, the three most promising were implemented in Python and interfaced with Cantera, an open source chemical kinetics package. Successfully removed over 75% of the reactions and 25% of the reactants without significantly degrading the quality of the simulation.

North Carolina State University, Raleigh, NC May 2010 - August 2010

- Graduate Student Researcher

  Worked in a group of graduate and undergraduate students with Zhilin Li on the Immersed Interface Method (IIM). Investigated using the IIM with finite differences to solve PDE's with sharp boundaries and discontinuous parameters and also implement these methods as algorithms in MATLAB. Created a poster and delivered presentations explaining the Immersed Interface Method. Collaborated in writing a paper that was later accepted for publication.

Clarion University of Pennsylvania, Clarion, PA August 2008 - December 2009

- Mathematics Tutor

  Tutored undergraduate courses in algebra, statistics, and precalculus as part of the Center for Academic Success. Provided the pedagogical scaffolding necessary to improve student achievement. Created outdoor exploration activities as well as team building exercises for newly accepted at-risk students at Clarion University of Pennsylvania. Resided with the students and provided instructional support. During the Fall semester, provided private tutoring in algebra.

Franklin Industries Company, Franklin, PA July 2006 - February 2008

- Inventory Manager and Government Contract Liaison

  Developed and assessed techniques to take inventory on live production lines. Automated the acquisition of inventory data from several sources which resulted in increased productivity by eliminating eight hours of now unnecessary tabulations per week. Communicated daily with the CEO, CFO, and production managers. Discussed marketing and production strategies with the Northwest PA regional business development district. Researched compliance and bidding methods for acquiring contracts with the Department of Defense. Assisted the CEO in bringing the shipping department into compliance with government contract requirements.

SERVICES

- President, Clemson University SIAM Chapter, Clemson, SC — Spring 2013-2014
- Treasurer, Clemson University SIAM Chapter, Clemson, SC — Spring 2012-2013
- Volunteer, Clemson Calculus Challenge, Clemson, SC — Spring 2013-2014
- Poster Contest Judge, Focus on Creative Inquiry, Clemson, SC — Spring 2013-2014
- Vice-President, Clarion University Pi Mu Epsilon Chapter, Clarion, PA — Fall 2009-Spring 2010
- President, Clarion University Mathematics Club, Clarion, PA — Spring 2009-Spring 2010
- Hurricane Katrina Relief, Lakeshore, MS — Winter 2009
- Mathematics Praxis Volunteer, Clarion, PA — Fall 2009
- Tour guide at historic Drakes Well, Titusville, PA — Summer 2009
- Historic Pithole Guided Tour Volunteer, Pithole, PA — Fall 2008-2009
- High School Mathematics Competition Judge, Clarion, PA — Fall 2008
- Hurricane Wilma Relief, Delray Beach, FL — Spring 2007

APPLICABLE COURSE WORK

Clemson University, Clemson, SC — August 2010 - Present

- Probability (MTHSC 800, 3 hrs)
- Stochastic Processes (MTHSC 803, 3 hrs)
- Data Analysis (MTHSC 805, 3 hrs)
- Mathematical Programming (MTHSC 810, 3 hrs)
- Stochastic Models in Operations Research I (MTHSC 817, 3 hrs)
- Linear Analysis (MTHSC 821, 3 hrs)
- Measure and Integration Theory (MTHSC 822, 3 hrs)
- Partial Differential Equations (MTHSC 826, 3 hrs)
- Fourier Series (MTHSC 831, 3 hrs)
- Matrix Analysis (MTHSC 853, 3 hrs)
- Introduction to Scientific Computing (MTHSC 860, 3 hrs)
- Advanced Numerical Analysis (MTHSC 861, 3 hrs)
- Data Structures (MTHSC 865, 3 hrs)
- Finite Element Method (MTHSC 866, 3 hrs)
- Special Topics: Turbulence Models (MTHSC 983, 3 hrs)
- Special Topics: Fluid Dynamics (MTHSC 983, 3 hrs)
- Special Topics: Numerical Methods for Fluid Flows (MTHSC 983, 3 hrs)
- Special Topics: The Finite Element Method in Scientific Computing (MTHSC 983, 3 hrs)
- Special Topics: Coding and Information Theory (MTHSC 985, 3 hrs)
- Special Topics: Optimization Models (MTHSC 988, 3 hrs)

Clarion University of Pennsylvania, Clarion, PA August 2003 - May 2010

- Introduction to Programming and Algorithms (CIS 163, 3 hrs)
- Survey of Computational Science Tools (CPSC 201, 3 hrs)
- Advanced Computational Science (CPSC 301, 3 hrs)
- Numerical Methods in Mathematics I (MATH 360, 3 hrs)
- Numerical Methods in Mathematics II (MATH 460, 3 hrs)
- Calculus I, II, III (MATH 270, 271, 272, 4 hrs each)
- Introduction to Advanced Mathematics (MATH 300, 3 hrs)
- Discrete Structures (MATH 340, 3 hrs)
- Differential Equations (MATH 350, 3 hrs)
- Modern Geometry (MATH 357, 3 hrs)
- Linear Algebra (MATH 370, 3 hrs)
- Modern Algebra I (MATH 451, 3 hrs)
- Theory of Numbers (MATH 454, 3 hrs)
- Introduction to Real Analysis I (MATH 471, 3 hrs)
- Elementary Applied Statistics (MATH 221, 3 hrs)
- Intermediate Applied Statistics (MATH 321, 3 hrs)
- Mathematical Statistics I (MATH 421, 3 hrs)