Adrianna Gillman

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EDUCATION

University of Colorado at Boulder (CUB)

Ph.D., Applied Mathematics   August 2011

Advisor: Per-Gunnar Martinsson

California State University, Northridge (CSUN)

M.S., Mathematics   June 2006

Advisor: Rabia Djellouli

CSUN

B.S., Mathematics   May 2003

Uppsala Universitet SWEDEN

Junior level undergraduate student   2001-2002

PROFESSIONAL EXPERIENCE

John Wesley Young Research Instructor in Mathematics   July 2011 - Present

Dartmouth College

Intern   June-August 2008

Summer Internships in Parallel Computational Science (SIParCS) program at National Center for Atmospheric Research (NCAR)

Visiting Graduate Research Assistant   January and December 2005

Laboratoire de Mathématiques Appliquées-UPPA Université de Pau FRANCE

RESEARCH INTERESTS

Generally speaking, I am interested in scientific computing, numerical methods for linear PDEs, and numerical linear algebra. My recent work has focused on the following areas:

- "Fast" algorithms such as the Fast Multipole Method and rank-structured fast linear algebraic solvers (fast direct solvers).

- Integral equation solvers for elliptic PDE.

- Integral equation formulations for the mathematical modeling of physics and other real world applications.

- Wave scattering, acoustics, variable media.

- Techniques for handling challenging geometries such as corners, edges, and periodic domains.

PUBLICATIONS

Integral equation based techniques for elliptic problems with mixed boundary conditions, In preparation.

A high-order accelerated direct solver for non-oscillatory integral equations on curved surfaces (with J. Bremer, and P.G. Martinsson), In review.

A spectrally accurate direct solution technique for frequency-domain scattering problems with variable media (with A. Barnett, and P.G. Martinsson), In review.

A direct solver with $O(N)$ complexity for variable coefficient elliptic PDEs discretized via a high-order composite spectral collocation method (with P.G. Martinsson), *Advances in Computational Mathematics* doi:10.1007/s10444-013-9326-z.

An $O(N)$ algorithm for constructing the solution operator to elliptic boundary value problems in the absence of body loads (with P.G. Martinsson), In review.

A fast solver for Poisson problems on infinite regular lattices (with P.G. Martinsson), *Journal of Computational and Applied Mathematics*, 258 (2014), pp. 42-56.

A simplified technique for the efficient and high-accuracy discretization of boundary integral equations in 2D on domains with corners (with S. Hao, and P.G. Martinsson), *Journal of Computational Physics*, 256 (2014) pp. 214-219.

A fast direct solver for quasi-periodic scattering problems (with A. Barnett), *Journal of Computational Physics*, 248 (2013), pp. 309-322.

A direct solver with $O(N)$ complexity for integral equations on one-dimensional domains (with P. Young, and P.G. Martinsson), *Frontiers of Mathematics in China*, 7 (2012), no. 2, pp. 217-247.

Numerical homogenization via approximation of the solution operator (with P. Young, and P.G. Martinsson), In B. Engquist, O. Runborg, R. Tsai, editors, *Numerical Analysis of Multiscale Computations*, volume 82 of Lecture Notes in Computational Science and Engineering, Heidelberg, 2011. Springer Verlag. pp. 187-216.

Fast and accurate numerical methods for solving elliptic difference equations defined on lattices (with P.G. Martinsson), *Journal of Computational Physics*, 229(2010), pp. 9026-9041.

A Mixed Hybrid Formulation Based on Oscillated Polynomials for Solving Helmholtz Problems (with R. Djellouli, and M. Amara), *Journal of Computational and Applied Mathematics*, 204(2007), pp.515-525.

THESES

Fast direct solvers for elliptic partial differential equations, PhD Thesis, CUB, 2011.

On the numerical performance of a mixed-hybrid type solution methodology for solving high-frequency Helmholtz problems, Masters Thesis, CSUN, 2006.

Academic Experiences and awards

AMS-Simons Travel Grant, July 2013-July 2015.

SIAM Travel Award to attend the SIAM Conference on the Computational Science and Engineering (CSE13), February 2013.

AWM-NSF Travel Grant to attend SIAM Conference on Applied Linear Algebra, June 2012.

SIAM Student Travel Award to attend the 7th International Congress on Industrial and Applied Mathematics (ICIAM 2011), July 2011.

IMA Hot Topics Workshops: Integral Equation Methods, Fast Algorithms and Applications, August 2010.

SIAM Student Travel Award to attend SIAM Conference on Applied Linear Algebra (LA09), October 2009.

Recipient of the Donald Bianchi Outstanding Graduate Student Research Award, 2006.

Invited Presentations

"A high-order accurate direct solution technique for acoustic scattering problems in 3D," Workshop on Integral Equations Methods: Fast Algorithms and Applications, December 2013.

"Fast direct solution techniques for elliptic partial differential equations," Computational Science Seminar at University of Massachusetts Dartmouth, April 2013.

"A fast direct solver for quasi-periodic scattering problems," CSE13, February 2013.

"A high order accurate method of solving free space scattering in variable media," CSE13, February 2013.

"Fast direct solution techniques for elliptic partial differential equations," Tufts University Mathematics Colloquium, December 2012.

"A composite spectral method for variable coefficient elliptic PDEs with its own fast direct solver," Numerical Analysis and Scientific Computing Seminar at Courant Institute of Mathematical Sciences, November 2012.

"Fast direct solvers for elliptic partial differential equations," 2012 New England Numerical Analysis Day, April 2012.

"Fast direct solvers for elliptic partial differential equations," ICIAM, July 2011.

"Fast direct methods for solving discretized elliptic partial differential equations," CSUN, November 2010.

PRESENTATIONS

"A high order accurate solution technique for free space scattering in variable media," SIAM Annual Conference, July 2013.

"A fast algorithm for constructing the solution operator for homogeneous elliptic boundary value problems," SIAM Conference on Applied Linear Algebra, June 2012.

"A high-order accurate discretization scheme for elliptic partial differential equations," ICIAM, July 2011.

"LU Factorization of Finite Difference Matrices in $O(N)$ Operations," SIAM Conference on Computational Science and Engineering, Febuaury 2011.

"Fast Computation of Schur Complements of Large Finite Difference Matrices," SIAM Annual Conference, July 2010.

"Sublinearly Fast Solvers for Finite Difference Operators on Mostly Structured Grids," SIAM Conference on Applied Linear, October 2009.

"A discontinuous Galerkin method based on oscillated finite elements and Lagrange multipliers for solving Helmholtz problems," 7th International Conference on Mathematical and Numerical Aspects of Wave Propagation, June 2005.

POSTERS

"A fast direct solution technique for two-dimensional quasi-periodic fields," Challenges in Geometry, Analysis, and Computation: High-Dimensional Synthesis Conference at Yale University, June 2012.

"A linear complexity direct solver for integral equations on one-dimensional domains," 40 Years and Counting Poster Session: AWMs Celebration of Women in Mathematics, September 2011.

PROFESSIONAL ACTIVITIES

Co-organizer for a minisymposium at SIAM Annual Conference in July 2013.

Co-organize the Applied and Computational Mathematics Seminar at Dartmouth College, 2011-present

SIAM member

Association for Women in Mathematics (AWM) member

Referee for SIAM Journal on Scientific Computing (SISC), SIAM Journal on Matrix Analysis and Applications (SIMAX), and the Journal of Computation Physics (JCP)

Organizer and faculty advisor of the Dartmouth SIAM Student Chapter

Teaching Experience

Instructor   Dartmouth College

Math 53 *Chaos!* (Dynamical Systems)   September -November 2013

Math 46 *Introduction to Applied Mathematics*   March -May 2013

Math 126 *Topics in Applied Mathematics: Partial differential equations*   January-March
2013

Math 23 *Differential Equations*   January- June 2012

Math 8 *Calculus II*   September- December 2011, January-March 2013

Teaching Assistant   CUB

Calculus II   September 2007 - May 2008

High school substitute teacher   Antelope Valley Union High School District

All subjects   September 2006-June 2007

Instructor   CSUN

College Algebra   September 2005 - June 2006

Teaching Assistant   CSUN

Preparing Undergraduates through Mentoring toward PhDs (PUMP) Summer Research
Institute   July 2005 and July 2006

Math Tutor   Math Support Services in Santa Clarita, CA

August 2000-July 2001 and August 2002-July 2003

References

Available upon request