Curriculum Vitae

Shijun Zheng

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Education

- Ph.D. in Mathematics, University of Maryland, 2003
  (Ph.D. Thesis advisor: Professor John J. Benedetto
  Co advisor: Professor Manoussos Grillakis)
  Thesis title: *Besov spaces for Schrödinger operators*
- M.A. in Mathematics, University of New Mexico, 1997
- M.S. in Mathematics, Nanjing University, China, 1993
  (Thesis advisor: Professor Weiyi Su)

Research Interests

- Schrödinger operators and nonlinear PDEs in Mathematical Physics
- Harmonic analysis on Lie groups, p-adic fields and Euclidean spaces
- Mathematical modeling in image processing and material science

Professional Experience

- March 2002, Visited University of California, Los Angeles. Research on harmonic analysis and Schrödinger operators.
- June–July, 2003. Postdoctoral-level researcher at the University of Maryland. Supported by DARPA grant (Defense Advanced Research Projects Agency).
- August, 2003—July, 2005. Postdoctoral Associate, Louisiana State University. Work on harmonic analysis and wavelets on symmetric spaces, Schrödinger operators and computational mathematics.
- August, 2005—July, 2007. Postdoctoral Fellow, University of South Carolina. Work on harmonic analysis and PDE related to wave and Schrödinger equations, and computational mathematics.
- April, 2005. Visited Princeton University. Research on harmonic analysis and Schrödinger equations.
- November, 2006. Visited Johns Hopkins University. Research on harmonic analysis and dispersive PDE
- April, 2008. Visiting Professor, Memorial University at Newfoundland, Canada.
- May 2009, Visited Nanjing University
- August, 2007–present. Assistant Professor, Georgia Southern University.

Honors and Awards

- Professeur Invitè, Universite de Nantes, France, July 2009.
- MSI Visiting Fellowship, Mathematical Sciences Institute, Australia National University, Canberra, March 2009.
- CLEC grant (with Patricia Humphrey), funded by Campus Life Enrichment Committee, Spring 2011
- GSU Foundation Grant, GSU, 2009-2010.
- Summer Visiting Scholar, Department of Mathematics, LSU, summer 2008.
- Grant proposal Support, GSU, summer 2008.
- Foundation Grant, GSU, 2007-2008.
- DARPA grant on the NGA project in computational mathematics supported via Industrial Mathematics Institute, USC, 2005-2007.
- NSF grant on computational research supported via CCT (Center for Computation and Technology), LSU, 2003-2005.
- DARPA grant on the TAIP project in thin film analog image processing, supported via University of Maryland, 2002-2003.
- Conference Travel Grant, University of Maryland, 2002.
- Dissertation Fellowship, Department of Mathematics, University of Maryland, 2001.
- Graduate Excellence Prize, China, 1994.
- Guanghua National Fellowship, China, 1994.
- Team titles and personal prize winner representing for Nanjing University in the Annual Intercollegiate English Contest, 1993-94.
- Yingsong Fellowship, Nanjing University, 1993.

Professional Activities and Services

- Membership: AMS
- Editorial Boards:
  Advances in Pure Mathematics,
  Applied Mathematics,
  Pioneer Journal of Mathematics and Mathematical Sciences,
  Pioneer Journal of Algebra, Number Theory and its Applications.
- Referee for numerous well-reputed Journals.
- Reviewer for *Mathematical Reviews* (Forty nine reviews since 2000)
- Organizer of the Classical and Applied Analysis Seminar, USC 2006-2007 academic year.
- Organizer of Harmonic Analysis and PDE Seminar, GSU 2007-2011.
- Colloquium Committee member, GSU 2007-2011 academic year.
- Host of Distinguished Lecture Series at GSU, February 2009 (Speaker: Professor Christopher D. Sogge).
- Hospitality Committee member, GSU 2009-2011.
- Organizer of *Harmonic Analysis and PDEs* Session, AMS Regional Conference, GSU, March 2011.
- Co-organizer of *Nonlinear Analysis of Partial Differential Equations*, AMS Regional Conference, GSU March 2011.
- Local Coordinate Committee for AMS Regional Conference, Statesboro, Georgia 2011.

Publications

Book volume

Recent Advances in Harmonic Analysis and PDEs, to be published with AMS in the book series of *Contemporary Mathematics* (Principal Editor).

Peer-reviewed Papers

[1] Fractional regularity for the nonlinear Schrödinger equation with magnetic elds (to be submitted).

[2] Spectral multipliers for Schrödinger operators, *Illinois Journal of Mathematics*. Volume **54**, No. 2.

[3] Note on gradient estimates of heat kernel for Schrödinger operators. **1** no.5, (2010) *Applied Mathematics*, 425–430.

[4] Strichartz estimates and local wellposedness for the Schrödinger equation with the twisted sub-Laplacian. *Proc. Centre Math. Appl. Austral. Nat. Univ.* **44**, Austral. Nat. Univ., Canberra, 2010, 233–243 (with Z. Zhang).

[5] Besov spaces for the Schrödinger operator with barrier potential. *Complex Analysis and Operator Theory* **4** (2010), 777–811, Birkhäuser. (with J. Benedetto).

[6] Interpolation theorems for self-adjoint operators. *Anal. Theory Appl.* **25**, no. 1, 2009, 79–85.

[7] Harmonic analysis related to Schrödinger operators. *Contemporary Mathematics* **464** 2008, 213–230. AMS Book Series (with G. Ólafsson).

[8] Time decay for Schrödinger equation with rough potentials. *Anal. Theo. Appl.* **23**(4), 2007.

[9] Spectral multipliers for Schrödinger operators, I. *Industrial Mathematics Institute Preprint Series* 2007, No.2. 1–24, USC.

[10] Time decay of quantum waves on Riemannian manifolds. Presented at AMS Conferences, Davidson, North Carolina 2007.

[11] Function spaces associated with Schrödinger operators: The Pöschl-Teller potential. *Journal of Fourier Analysis and Applications* **12** no.6, 2006. (with G. Ólafsson)

[12] Littlewood-Paley theorem for Schrödinger operators. *Anal. Theo. Appl.*, **22**(4), 2006.

[13] A representation formula related to Schrödinger operators, *Anal. Theo. Appl.*, **20**(3), 2004.

[14] *Besov spaces for Schrödinger operators*, *Dissertation*, University of Maryland, College Park, 2003.

[15] Cesàro summability of Hardy spaces on the ring of integers in a local field, *Journal of Mathematical Analysis and Applications*, **249**, 2000.

[16] Remarks on self-similar fractal sets, *Journal of Nanjing University, Mathematical Biquarterly*, **16**(1), 1999. (with Weixing Zheng)

[17] L^p estimates for the iterated Hardy-Littlewood maximal operator, *Approximation Theory and Its Application*, **14**(3), 1998. (with Weiyi Su)

[18] Almost everywhere convergence of sequences of multiplier operators on local fields, *Science in China* (Series A), **40**(1), 1997. *# MR 98g:43010* (with Weixing Zheng)

[19] Riesz type kernels over the ring of integers of a local field, *Journal of Mathematical Analysis and Applications*, **208**, 1997. *# MR 98i:43003*

[20] A note on Riesz means over the ring of $p-$adic integers, *Journal of Nanjing University, Mathematical Biquarterly*, **13**(1), 1996.
 # MR 97k:43012 (with Jianming Liu)

[21] Translation from the English version "*Encyclopedia of Mathematics*", Natural Science Press, Beijing, 1995.
[22] On Riesz type kernels over local fields, *Approximation Theory and Its Application*, **11**(4), 1995. *# MR 97i: 43004*
[23] Representation theorems on local fields, *Journal of Nanjing Univ. (Natural Science Edition)*, **29**(4), 1993. *# MR 95c: 43006*

Preprints

[1] Spectral multipliers for Schrödinger operators II.
[2] Dispersive estimates for wave and Schrödinger equations with potentials near $L^{n/2}(\mathbb{R}^n)$.
[3] Smoothing estimates for nonlinear Schrödinger equation with magnetic potentials of polynomial growth. (with M. Grillakis)

Work in progress

[1] Wellposedness and scattering for L^2-critical nonlinear Schrödinger equation. (with M. Grillakis)
[2] On semilinear wave equation on Riemannian symmetric spaces.
[3] Besov spaces, wavelets and integrable representations. (with G. Ólafsson)
[4] Multiplier operators on Hardy spaces over local fields.
[5] Weak type estimates of singular integrals on Riemannian symmetric spaces.

Technical Reports

[1] *Wavelet computations on the TAIP project (Thin Film Analog Image Processing)* (with J.J. Benedetto, D. Healy, I. Konstantinidis), Dept. Math. at Univ. of Maryland and Inst. of Inform. Tech. at Univ. of Houston, 2003.
[2] *Facet modeling for 2D equilibrium crystal solid film.* Louisiana State University, 2004.

Invited Talks: Seminars, Conferences, Workshops

• *Besov spaces associated with Schrödinger operators*, Analysis and PDE Seminar, University of California at Los Angeles, Los Angeles, March, 2002. Invited and Supported by Terence Tao.
• Schödinger operators, Besov spaces, and Wavelet computations for thin film image processing. Harmonic Analysis Seminar, University of Maryland, October 31, 2002.
• *Wavelet decompositions for semigroup operators*,
NSF *FRG* workshop on Wavelets, Frames, and Operator Theory, University of Maryland, College Park, January, 2003.
• *Operator Reconstruction in Wavelet Basis and Its Applications in PDEs*, The Sixth International Joint Meeting of the AMS and the SMM, Houston, May, 2004.
• *Operator Representations and Applications in PDEs*, The Second International Conference on Computational Harmonic Analysis, Nashville,
May 24-30, 2004.
• *Multiscale operator reconstructions and time-dependent PDEs*, Applied Mathematics Seminar, Princeton University, April, 2005.
• *Spectral multipliers for Schrödinger operators.* AMS Special Session on Harmonic Analysis: Trends and Perspectives, Salt Lake City, Utah, October 7-8, 2006.

• *Spectral calculus for Schrödinger operators in one and three dimensions.* Analysis and PDE Seminar, Johns Hopkins University, Baltimore, November 5-7, 2006.

• *Spectral calculus in function spaces and quantum scattering. Harmonic and Geometric Analysis*, NSF-LSU Workshop. Louisiana State University, Baton Rouge, January 3-4, 2007.

• *Time decay of quantum waves on Riemannian manifolds – Recent development.* Between Harmonic Analysis, Number Theory, and Combinatorics. AMS Conference. Davidson, North Carolina, March 3-4, 2007.

• *Strichartz Estimates for Schroedinger Equation with a Magnetic Potential.* The Norbert Wiener Center Seminar, University of Maryland, College Park, February 17-20, 2009.

• *Spectral Calculus for Schroedinger Operators.* PDE-Analysis Seminar, The Australian National University, Mathematical Sciences Institute, Canberra, March 2009.

• *Spectral Multipliers for Schroedinger Operators.* Analysis Seminar, The University of New South Wales, School of Mathematics and Statistics, Sydney, April 1, 2009.

• *One-and-a-half-day Mini-workshop* at Macquarie University on Harmonic Analysis and Partial Differential Equations. April 2-3, 2009 (40-minute lectures).

• *Spectral Calculus for Differential Operators with Nonsmooth Coefficients.* Séminaire d'Analyse, Université de Nantes, Laboratoire de Mathématiques Jean Leray, France July, 2009.

• *Spectral Calculus for Differential Operators with Nonsmooth Coefficients.* Differential Equations Seminar, University of Missouri, Columbia, March 24-26, 2010.

• *Nonlinear Schroedinger equation with a Magnetic Potential.* PDE Seminar, Georgia Institute of Technology, Atlanta, October 5-6, 2010.

• *The Norbert Wiener Center Seminar*, The University of Maryland, November 29-December 1, 2010.

• *The 7th International Conference on Differential Equations and Dynamical Systems.* University of Florida, Tampa, December 15-18, 2010.

• *Workshop on Analysis and Geometry* sponsored by NSF, Louisiana State University, January 4-5, 2011.

• *Long Time Solutions of the Nonlinear Schrödinger Equation with a Magnetic Field.* Southeastern Atlantic Regional Conference on Differential Equations (SEARCDE), NSF-GSU sponsored, Sept.30 to Oct.1, 2011.

Colloquium Talks

• *Schrödinger operators, Besov spaces and Wavelet computations for thin film image processing.* University of Houston, Houston, November, 2002.

• *Time decay for Schrödinger operators.* Western Kentucky University, Bowling Green, Kentucky, February, 2007.

• *Spectral calculus in quantum scattering.* Georgia Southern University, Statesboro, Georgia, March, 2008.

• *Time decay for dispersive equations.* Wright State University, Dayton, Ohio. April 2007.

• *Spectral calculus in quantum scattering.* University of Rhode Island, Kingston, Rhode Island, April 2007.

• *Spectral calculus, Besov spaces and dispersive equations.* Memorial University of Newfoundland, St. Johns, Canada April 14-18, 2008.

• *Harmonic Analysis and Nonlinear Schrödinger Equations.* University of California Riverside. November 4-6, 2008.

• *Harmonic Analysis and Nonlinear Schrödinger Equations*, Departmental Colloquium in Mathematics and Physics, Augusta State University, Augusta, Georgia, November 14, 2008.

• *Semilinear Schrödinger Equation with Magnetic Potentials*, PHYSICS DEPARTMENT COLLOQUIUM, GSU, April 2011.

Conferences

• Introductory Workshop on Harmonic Analysis, Mathematical Sciences Research Institute, Berkeley, 1997.

• The First New Mexico Analysis Seminar (Sponsored by NSF), New Mexico State University, Las Cruces, March, 1998.

• Harmonic Analysis and Applications Conference, University of Maryland, College Park, 1999.

• *The Schrödinger equation and oscillatory Hilbert transforms*, Wavelet-Harmonic Analysis Seminar, University of Maryland, College Park, 2000.

• The Fourth Riviere-Fabes Symposium on Analysis and PDE, The School of Mathematics and IMA (Institute for Mathematics and its Applications), University of Minnesota, Minneapolis, 2001.

• *Spectral multiplier theorems for 1-D Schrödinger operators*, The 27th Arkansas Spring Lecture, University of Arkansas, 2002.

• *Littlewood-Paley theory associated with Schrödinger operators*, AMS Annual Conference on Operator Theory, in honor of Stone and von Neumann, Baltimore, Jan.16, 2003.

• The Sixth Riviere-Fabes Symposium on Analysis and PDE, The School of Mathematics and IMA (Institute for Mathematics and its Applications), University of Minnesota, Minneapolis, 2003.

• Workshop on *New Mathematics and Algorithm for 3D Image Analysis*, Louisiana State University, Baton Rouge, LA, September, 2003.

• NSF *FRG* Workshop on Wavelets, Frames and Operator Theory, 2003, Georgia Institute of Technology, Atlanta, October, 2003.

• *Littlewood-Paley theory, Atomic decomposition and Schrödinger equations on* $\mathbb{R}^n$, AMS Annual Meeting, Atlanta, January, 2005.

• *Spectral calculus and dispersive estimates for wave and Schrödinger equations.* IMI Analysis Seminar, University of South Carolina. March 22, 2006.

• NSF FRG Conference. *Interactions between Harmonic Analysis and Partial Differential Equations.* University of Missouri, Columbia. March 24-26, 2006.

• JAMI Conference. *Nonlinear dispersive equations.* Johns Hopkins University. Baltimore, March 14–18, 2007.

• The 11th Riviere-Fabes Symposium on Analysis and PDE, University of Minnesota, Minneapolis, April 11-13, 2008.

• February Fourier Talks, The Norbert Wiener Center for Harmonic Analysis and Applications, University of Maryland, February 18 - 19, 2010.

Computer Skills

• Extensive knowledge of scientific computing and numerical analysis, including fast Fourier transform and wavelet transform methods in solving PDEs. Numerical integration and approximation, using *Matlab*, *Mathematica*, *C*, C^{++}, or *Fortran* for programming. Experiences in UNIX (Solaris, MacIntosh, Linux systems) and Window

Language Skills:

- Chinese, English, German.