Curriculum Vitae

ZUOQIANG SHI

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Education

- Sep. 2003–Jul 2008: Ph.D. in Applied Mathematics, Zhou Pei-yuan Center for Applied Mathematics, Tsinghua University, Beijing, China.
  Dissertation: Efficient Semi-Implicit Schemes for Immersed Boundary Method.
  Supervisor: Prof. Thomas Y. Hou
- Nov. 2006–Feb. 2008: Special doctoral student in Applied and Computational Mathematics, Caltech, United States and completed the Ph.D. thesis under the direction of Prof. Thomas Y. Hou.
- Sep. 1999–Jul 2003: B.S. in Mathematics, Department of Mathematical Science, Tsinghua University, Beijing, China.

Positions

- Sep. 2015–Feb. 2016: Visiting Associate Researcher, Department of Mathematics, UCLA.
- Sep. 2011–Current: Associate professor, Mathematical Sciences Center, Tsinghua University.
- Sep. 2008–Sep. 2011 : Postdoctoral Scholar in Applied & Computational Mathematics, Caltech.

Research Interests

- Sparse Time-Frequency representation of nonlinear and nonstationary data.
- Numerical methods for PDEs on point clouds.
- Nonlocal PDE method for image processing and data analysis.
- Analysis and computation of fluid with interface.

Journal Publications

1. Zuoqiang Shi and Jianke Yang, Solitary waves bifurcated from Bloch-band edges in two-dimensional periodic media, *Phys. Rev. E*, **75**, 056602, 2007.

2. Thomas Y.Hou and Zuoqiang Shi, An efficient semi-implicit immersed boundary method for the Navier-Stokes equations, *J. Comput. Phys.*, **227**, pp. 8968-8991, 2008.

3. Thomas Y.Hou and Zuoqiang Shi, Removing the stiffness of elastic force from the immersed boundary method for the 2D Stokes equations , *J. Comput. Phys.*, **227**, pp. 9138-9169, 2008.

4. Z. Shi, J. Wang, Z. Chen and J. Yang, Linear instability of two-dimensional low-amplitude gap solitons near band edges in periodic media, *Phys. Rev. A*, **78**, 063812, 2008.

5. T. Y. Hou, C. Li, Z. Shi, S. Wang and X. Yu, On Singularity Formation of a Nonlinear Nonlocal System , *Archive for Rational Mechanics and Analysis*, **199**, pp. 117-144, 2011.

6. Thomas Y. Hou and Zuoqiang Shi, Adaptive Data Analysis via Sparse Time-Frequency Representation, *Advances in Adaptive Data Analysis*, **3**, pp. 1-28, 2011.

7. Thomas Y. Hou, Zuoqiang Shi and Shu Wang, On Singularity Formation of a 3D Model for Incompressible Navier-Stokes Equations, *Advances in Mathematics*, **230**, pp. 607-641, 2012.

8. Thomas Y. Hou and Zuoqiang Shi, Dynamic Growth Estimates of Maximum Vorticity for 3D Incompressible Euler Equations and the SQG Model, *Discrete and Continuous Dynamical System-A*, **32(5)**, pp. 1449-1463, 2012.

9. Thomas Y. Hou and Zuoqiang Shi, Data-Driven Time-Frequency Analysis, *Appl. Comput. Harmon. Anal.*, **35**, pp. 284-308, 2013.

10. Y. Shi, K. F. Li, Y. L. Yung, H. H. Aumann, Z. Shi, and T. Y. Hou, A Decadal Microwave Record of Tropical Air Temperature from AMSU-A/Aqua Observations, *Climate Dynamics*, **41(5-6)** , pp. 1385-1405, 2013.

11. Thomas Y. Hou and Zuoqiang Shi, Sparse Time-Frequency Representation of Nonlinear and Nonstationary Data, *Science China Mathematics*, **56(12)**, pp. 2489-2506, 2013.

12. T. Y. Hou, Z. Shi and P. Tavallali, Convergence of a data-driven time-frequency analysis method, *Appl. Comput. Harm. Anal.*, **37(2)**, pp. 235-270, 2014.

13. M. Ci, T. Y. Hou and Z. Shi, A Multiscale Model Reduction Method for Partial Differential Equations, *ESAIM:Mathematical Modelling and Numerical Analysis*, **48**, pp. 449-474, 2014.

14. T. Y. Hou, Z. Shi and P. Tavallali, Extraction of Intrawave Signals Using Sparse Time-Frequency Representation Method, *SIAM Multi. Model. Simul.* , **12(4)**, pp. 1458-1493, 2014.

15. T. Y. Hou, Z. Shi and P. Tavallali, Sparse Time Frequency Representations and Dynamical Systems, *Commun. Math. Sci.*, **13(3)**, pp. 673-694, 2015.

16. C. Liu, Z. Shi and T. Y. Hou, On the Uniqueness of Sparse Time-Frequency Representation of Multiscale Data, *SIAM Multi. Model. Simul.*, **13(3)**, pp. 790-811, 2015.

17. Thomas Y. Hou and Zuoqiang Shi, Extracting a shape function for a signal with intrawave frequency modulation, *Philosophical Transactions A*, **374**, 20150194, 2016.

18. Thomas Y. Hou and Zuoqiang Shi, Sparse Time-Frequency decomposition by dictionary adaptation, *Philosophical Transactions A*, **374**, 20150192, 2016.

19. Zhen Li and Zuoqiang Shi, A convergent point integral method for isotropic elliptic equations on point cloud, accepted by *SIAM Multi. Model. Simul.*, 2016.

20. Y. Bao, Z. Shi, J. L. Beck, H. Li and T. Y. Hou, Identification of time-varying cable tension forces based on adaptive sparse time-frequency analysis of cable vibrations, accepted by *Structural Control and Health Monitoring*, 2016.

PREPRINT

1. Z. Li, Z. Shi and J. Sun, Point Integral Method for Solving Poisson-type Equations on Manifolds from Point Clouds with Convergence Guarantees, arXiv:1409.2623.

2. Zuoqiang Shi and Jian Sun, Convergence of the Point Integral method for the Poisson equation on manifolds I: the Neumann Boundary, arXiv:1403.2141.

3. Zuoqiang Shi and Jian Sun, Convergence of the Point Integral method for the Poisson equation on manifolds II: the Dirichlet Boundary, arXiv:1312.4424 .

4. Z. Shi and J. Sun, Convergence of Laplacian spectra on point cloud, arXiv:1506.01788

5. Zuoqiang Shi, Enforce the Dirichlet boundary condition by volume constraint in Point Integral method, arXiv:1506.02343

6. Z. Shi, J. Sun and M. Tian, Harmonic extension on point cloud, arXiv:1509.06458

7. Zuoqiang Shi, Convergence of Laplacian spectra from random samples, arXiv:1507.00151

8. T. Y. Hou and Z. Shi, Sparse Time-Frequency decomposition for multiple signals with same frequencies, arXiv:1507.02037

9. Z. Li, Z. Shi and J. Sun, Point integral method for elliptic equations with variable coefficients on point clouds.

10. S. Osher, Z. Shi and W. Zhu, Low dimensional manifold model for image processing, UCLA CAM Report 16-04, 2016.

Teaching

- 2009-2010 Winter term, ACM 105: Applied Real and Functional Analysis.
- 2012-2013 Fall term, Equations of Mathematical Physics.
- 2012-2013 Spring term, Calculus II.
- 2013-2014 Fall term, Linear Algebra I.
- 2014-2015 Fall term, Calculus I.

Talks

- Invited talk at "International Conference: Nonlinear Waves - Theory and Applications", Tsinghua University, Beijing, China, Jun. 9-12, 2008.
  Title: Instability of Two-dimensional Lattice Solitons Near Edges of Bloch Bands in Periodic Media.
- Talk at "ACM Colloquia", Caltech, Mar. 9, 2009.
  Title: Efficient Semi-implicit Schemes for Immersed Boundary Method.
- Invited talk at "The Second International Conference: Nonlinear Waves - Theory and Applications", Tsinghua University, Beijing, China, Jun. 26-29, 2010.
  Title: On Singularity Formation of a Nonlinear Nonlocal System.
- Talk at AMS 2010 Fall Western Section Meeting, UCLA, Oct. 9-10, 2010.
  Title: On Singularity Formation of a 3D Model for the 3D Incompressible Navier-Stokes Equations.
- Talk at Tsinghua Sanya International Mathematics Forum, Sanya, Dec. 19-21, 2011.
  Title: On Singularity Formation of a 3D Model for Incompressible Navier-Stokes Equations
- Invited talk at International Workshop on Recent Advances in Scientific and Engineering Computing, Shanghai Jiaotong University, Oct. 20-22, 2012.
  Title: On the instantaneous frequency of nonstationary data
- Invited talk at Workshop on Adaptive Data Analysis and Sparsity, IPAM, UCLA, Jan. 28-31, 2013.
  Title: Iterative Matching Pursuit and its Application in Adaptive Time-Frequency Analysis

- Invited talk at Research Center for Adaptive Data Analysis, National Central University, Taiwan, Apr. 29, 2013.
  Title: Data-Driven Time-Frequency Analysis via Nonlinear Optimization.

- Invited talk at Department of Mathematics, National Central University, Taiwan, May 2, 2013.
  Title: Data-Driven Time-Frequency Analysis via Nonlinear Optimization.

- Invited talk at ICMSEC, Chinese Academy of Sciences, Beijing, Jan. 16, 2014.
  Title: A numerical method for Poisson equation on point cloud and its convergence

- Invited talk at National Tsing Hua University, Hsinchu, Taiwan, Mar. 18, 2014.
  Title: Finite Integral method: A meshless approach for Poisson equation on point cloud.

- Invited talk at IAPCM, Beijing, Sep. 19, 2014.
  Title: Finite Integral method: A meshless approach for Poisson equation on point cloud.

- Invited talk at workshop on Recent Advances in Numerical Analysis, Shanghai Jiao Tong University, Nov. 15-16, 2014.
  Title: Graph Laplacian and Laplace-Beltrami operator on point cloud.

- Invited keynote talk at workshop on Statistics and Computational Interface to Big Data, Hong Kong, Jan. 4-16, 2015.
  Title: Efficient Methods to Approximate Laplace-Beltrami operator on large data clouds.

- Invited talk at International Conference on Optimization, Sparsity and Adaptive Data Analysis, Mar. 18-22, 2015.
  Title: Data-Driven Time-Frequency Analysis.

- Invited talk at National Chiao Tung University, Hsinchu, Taiwan, Apr. 17, 2015.
  Title: Finite Integral method: A meshless approach for Poisson equation on point cloud.

- Invited talk at National Chiao Tung University, Hsinchu, Taiwan, Apr. 24, 2015.
  Title: Data-Driven Time-Frequency Analysis.

- Invited talk at Beijing Computational Science Research Center, May 12, 2015.
  Title: Point Integral Method: A meshless approach on point cloud with convergence guarantee.

- Invited talk at Department of Mathematics, UC Riverside, Oct. 28, 2015.
  Title: A numerical method for Poisson equation on point cloud.

- Invited talk at Department of Mathematics, UCLA, Feb. 2, 2016.
  Title: Harmonic Extension on Point Cloud.

- Invited talk at Department of Mathematics, UC Santa Barbara, Feb. 5, 2016.
  Title: Harmonic Extension on Point Cloud.

- Invited talk at workshop on Shape Analysis and Learning by Geometry and Machine, IPAM, Feb. 10, 2016.
  Title: Low Dimensional Manifold Model for Image Processing.