Shun Zhang

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Employment

Postdoctoral Research Associate at Division of Applied Mathematics, Brown University,
with Professor **Jan Hesthaven**, June 2010 –

Postdoctoral Research Associate at Department of Mathematics, Purdue University,
with Professor **Zhiqiang Cai,** August 2009-May 2010

Education

• **Purdue University, Ph.D. in Mathematics,** West Lafayette, IN 2003 - 2009
Advisor: Professor **Zhiqiang Cai**
•**Tongji University M.Sc. in Mathematics,** Shanghai, China 2000 - 2003
•**Tongji University B.Sc. in Mathematics,** Shanghai, China 1996 - 2000

Awards & Honors

The SIAM Student Paper Prize SIAM Annual Meeting, Denver, 2009
http://www.siam.org/prizes/sponsored/student_paper.php
Bilsland Dissertation Fellowship, Purdue University 2008–2009
One Year Support from Purdue Research Foundation (PRF) 2007–2008
Ranked 24 in National College Entrance Examination in Zhejiang Province, China. 1996

Research Interests

• Applied Mathematics in general
• Numerical Analysis and Scientific Computing in general
• Finite Element Methods, Adaptive Methods, A Posteriori Error Estimations
• Reduced Basis Methods, Multiscale Methods

Publications (including accepted papers)

1. J. Hesthaven, B. Stamm, and S. Zhang, *Certified reduced basis methods for the electric field integral equation*, **SIAM J. Sci. Comput.,** Vol. 34, No. 3, pp. A1777--A1799, 2012.
2. Z. Cai and S. Zhang, *Robust equilibrated residual error estimator for diffusion problems: Conforming elements,* **SIAM J. Numer. Anal.** Vol. 50, No.1 pp. 151-170, 2012.
3. Z. Cai and S. Zhang, *Mixed methods for Stokes and Navier-Stokes equations based on pseudostress-pressure-velocity formulation*, **Math. Comp.** (2012), Posted: March 28, 2012.
4. Z. Cai, X. Ye, and S. Zhang, *Discontinuous Galerkin finite element methods for interface problems: A priori and a posteriori error estimations*, **SIAM J. Numer. Anal**., Vol 49, No.5, pp. 1761-1787, (2011).
5. Z. Cai and S. Zhang, *Robust residual- and recovery-based a posteriori error estimators for interface problems with flux jumps*, DOI: 10.1002/num.20629, **Numerical Methods for Partial Differential Equations,** (2010).

6. Z. Cai and S. Zhang*, Flux recovery and a posteriori error estimators: conforming elements for scalar elliptic equations*, **SIAM J. Numer. Anal.,** Vol. 48, No. 2, pp. 578–602, (2010).
7. Z. Cai, C. Wang and S. Zhang, *Mixed finite element methods for incompressible flow: stationary Navier-Stokes equations***, SIAM J. Numer. Anal.,** Vol. 48, No. 1, pp. 79–94, (2010).
8. Z. Cai and S. Zhang, *Recovery-based error estimators for interface problems: mixed and nonconforming finite elements*, **SIAM J. Numer. Anal.,** Vol. 48, No. 1, pp. 30–52, (2010).
9. Ph.D. Thesis: *Robust Recovery Based A Posteriori Error Estimators for Various Lower-Order Finite Element Approximations to Interface Problems*, Purdue University, 2009
10. Z. Cai and S. Zhang, *Recovery-based error estimators for interface problems: conforming linear elements*, **SIAM J. Numer. Anal**., Vol. 47, No. 3, pp. 2132-2156, (2009). (Winner of 2009 **SIAM Student Paper Prize**).
11. Master Thesis: *Mortar Methods for Stokes Equations*, Tongji University, 2003.
12. Y. Shu, S. Zhang, Z. Huang, and W. Wu*, A mortar finite element method for linear Poisson-Boltzmann equation*, **Comm. on Appl. Math. and Comput**.,16, 1-8 (2002).
13. S. Zhang, S. Chen, and Z. Huang, *Deduction and computation of strongly implicit procedure method for seven-diagonal finite difference method of 3 dimensions*, **J. of Tongji Univ.,** 29, 857-861. (2001).

Publications (papers submitted and preprints)

- J. Hesthaven and S. Zhang, *On the use of ANOVA expansions in reduced basis methods for high-dimensional parametric partial differential equations*, Brown Division of Applied Math Scientific Computing Tech Report 2011-31, submitted to **J. Sci. Computing**, 2012.
- S. Zhang, *Efficient greedy algorithms for successive constraints methods with high-dimensional parameters*. Brown Division of Applied Math Scientific Computing Tech Report 2011-23
- J. Hesthaven, B. Stamm, and S. Zhang, *Efficient greedy algorithms for high-dimensional parameter spaces with applications to empirical interpolation and reduced basis methods*, Brown Division of Applied Math Scientific Computing Tech Report 2011-15. **ESAIM: Mathematical Modelling and Numerical Analysis (M2AN),** submitted
- Z. Cai, and S. Zhang, *A note on Discontinuous Galerkin methods,* submitted to **SIAM J. Numer. Anal**.
- Z. Cai and S. Zhang, *Recovery-based error estimators for interface problems: Explicit formulas,* to be submitted
- Z. Cai and S. Zhang, *Optimal error estimate of Discontinuous Galerkin methods for elliptic problems with low regularity,* manuscript in preparation
- *Least-Squares finite element methods for nonlinear conservation laws*, manuscript in preparation
- Z. Cai and S. Zhang, *Stress recoveries and a posteriori error estimators: conforming elements for elasticity ,* (manuscript).
- Z. Cai and S. Zhang, *Quasi-robust a posteriori error estimator for the nonlinear Poisson-Boltzmann equation*, (to be submitted).

Talks

- (April 2012) Recovery based a posteriori error estimators for FEM, Nanyang Technological University.
- (October 2011) Efficient Greedy Algorithms for Reduced Basis Methods, Finite Element Circus, University of Connecticut.
- (May 2011) A Piecewise Constant Enriched Continuous Galerkin Method for Problems with Discontinuous Solutions, Midwest Numerical Analysis Day, Purdue University.
- (April 2011) Differential Forms, Intrinsic Continuity, and a Framework of Constructing Robust Recovery-Based a posteriori Error Estimators for Finite Element Methods, Brown-Paris 6 seminar, Division of Applied Mathematics Brown University.
- (March 2010) Robust recovery based a posteriori error estimators for FEMs for interface problem, Applied Mathematics Seminar, IUPUI, Indianapolis.

- (October 2009) An a priori error analysis of DG methods for elliptic equations with low regularity, Finite Element Circus, The University of Tennessee, Knoxville.
- (July 2009) Robust recovery based a posteriori error estimators for FEMs, Tongji University, Shanghai.
- (July 2009) Robust recovery based a posteriori error estimators for FEMs, SIAM Student Paper Prize Presentation, 2009 SIAM Annual Meeting, Denver, CO.
- (April 2009) Robust recovery based a posteriori error estimators for FEMs, SIAM @ Purdue Student Conference.
- (November 2008) Robust recovery based error estimators for FEMs, Applied Math Lunch Seminar, Purdue University.
- (October 2008) Recovery based error estimators for interface problems: Mixed and nonconforming finite elements, Finite Element Circus, RPI.
- (July 2008) Flux Recovery based error estimators for higher order FEMs, 2008 SIAM Annual Meeting, San Diego, CA.
- (August 2002) A multigrid algorithm for mortar finite element methods for Stokes problems, Satellite Conference on Scientific Computing of International Congress of Mathematics 2002, Xi'an.

Teaching Experience

Methods of Applied Mathemstics II, (Undergraduate Course), Brown University, Fall, 2012

Topics in A posteriori error estimations: finite element and reduced basis methods, Brown University, Spring 2012

Graduate Teaching Assistant (course instructor and recitation instructor) at Purdue University for various mathematical courses, including Algebra and Trigonometry, Multivariable Calculus, One Variable Calculus, Ordinary Differential Equations.

Review for Journals

SIAM Journal on Numerical Analysis, Journal of Computational Physics, Journal of Scientific Computing, ESAIM: Mathematical Modelling and Numerical Analysis (M2AN)

Other Research Experience

- Attend CBMS Conference on Adaptive Finite Element Methods for Partial Differential Equations, College Station, TX, May 18-22, 2009
- Summer Student at Institute for Scientific Computing Research of Lawrence Livermore National Laboratory, Mentor: Panayot Vassilevski, June 2005 -August 2005
- Member of American Mathematical Society (AMS), since 2004.
- Member of Society for Industrial and Applied Mathematics (SIAM), since 2004.

References

• Professor Zhiqiang Cai, Purdue University, West Lafayette, IN, zcai@math.purdue.edu
• Professor Jan S. Hesthaven, Brown University, Providence, RI, jan.hesthaven@brown.edu
• Professor Jie Shen, Purdue University, West Lafayette, IN, shen7@purdue.edu