Zhu Wang

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Education

B.A. Information & Computational Mathematics, Sichuan University, China, 2003

M.S. Computational Mathematics, Sichuan University, China, 2006

Ph.D. Applied Mathematics, Virginia Tech, USA, May 2012

Professional Experience

University of South Carolina, Columbia, South Carolina, USA

– Assistant Professor, Department of Mathematics, August 2014 - present

University of Minnesota, Twin Cities, Minnesota, USA

– Industrial Postdoc, Institute for Mathematics and its Applications, August 2012 - August 2014

Argonne National Laboratory, Argonne, Illinois, USA

– Givens Associate, Mathematics and Computer Science Division, summers of 2010 and 2011

University of Electronic Science and Technology of China, Chengdu, China

– Lecturer, School of Mathematical Science, August 2006 - July 2007

Teaching Experience

University of South Carolina

- 2017: Math 344 Applied Linear Algebra
- 2016: Math 142 Calculus II, 344 Applied Linear Algebra, 721 Applied Mathematics II
- 2015: Math 241 Vector Calculus, 242 Differential Equations, 720 Applied Mathematics I
- 2014: Math 141 Calculus I, 520 Differential Equations

Virginia Tech

- Math 1205 Calculus, 1224 Vector Geometry Recitation, 2015 Elementary Calculus with Trig II

UESTC

- Probability & Statistics, Advisor of Mathematical Contest in Modeling

Supervision of Student Research

- Graduate students: Shuai Yuan (major advisor) and Chenfei Zhang (co-advisor), 2014-present

- Postdoctoral fellow: Thi Thao Phuong Hoang (co-supervisor), 2017/1-present

Research Interests

Scientific Computing, Numerical Analysis, Reduced-Order Modeling, Climate Modeling, Large Eddy Simulation, Numerical Solutions to PDEs

Publications

Journal Articles

Submitted

1. M. Gunzburger, N. Jiang and *Z. Wang* A second-order time-stepping scheme for simulating ensembles of parameterized flow problems, **submitted**, 2017

2. B. Cockburn and *Z. Wang*. Adjoint-based, superconvergent Galerkin approximations of linear functionals, **submitted**, 2017

3. X. Xie, D. Wells, *Z. Wang*, and T. Iliescu. Numerical Analysis of the Leray Reduced Order Model, **submitted**, 2017

4. J. Liu and *Z. Wang*. Efficient Time Domain Decomposition Algorithms for Parabolic PDE-Constrained Optimization Problems, **submitted**, 2016

5. M. Gunzburger, N. Jiang and *Z. Wang* An efficient algorithm for simulating ensembles of parameterized flow problems, **submitted**, 2016

In press

1. L. Ju and *Z. Wang*. Exponential Time Differencing Gauge Method for Incompressible Viscous Flows, **Comm. Comp. Phys.**, to appear, 2017

2. D. Wells, X. Xie, *Z. Wang* and T. Iliescu. An Evolve-Then-Filter Regularized Reduced Order Model For Convection-Dominated Flows, **Int. J. Numer. Meth. Fluids**, to appear, 2017

3. H. Fu, H. Wang, and *Z. Wang*. POD/DEIM Reduced-Order Modeling of Time-Fractional Partial Differential Equations with Applications in Parameter Identification, **J. Sci. Comput.**, to appear, 2017

In print

1. Y. Gong, Q. Wang and *Z. Wang*. Structure-Preserving Galerkin POD Reduced-Order Modeling of Hamiltonian Systems, **Comput. Meth. Appl. Mech. Eng.**, vol. 315, 2017, pp. 780-798

2. X. Xie, D. Wells, *Z. Wang*, and T. Iliescu. Approximate Deconvolution Reduced Order Modeling, **Comput. Meth. Appl. Mech. Eng.**, vol. 313, 2017, pp. 512-534

3. J. Borggaard, *Z. Wang* and L. Zietsman. A Goal-Oriented Model Reduction Approach for Complex Systems, **Comput. Math. Appl.** 71 (11), 2016, pp. 2155-2169

4. *Z. Wang*, B. McBee and T. Iliescu. Approximate Partitioned Methods of Snapshots for POD, **J. Comput. Appl. Math.**, vol. 307, 2016, pp. 374-384

5. L. Rondi, F. Santosa and *Z. Wang*. A Variational Approach to the Inverse Photolithography Problem, **SIAM J. Appl. Math.**, vol. 76 (1), 2016, pp. 110-137

6. *Z. Wang*. Nonlinear Model Reduction Based on the Finite Element Method With Interpolated Coefficients: Semilinear Parabolic Equations. **Numer. Meth. Partial. Diff. Eqs.** vol. 31 (6), 2015, pp. 1713-1741

7. T. Iliescu and *Z. Wang*. Are the Snapshot Difference Quotients Needed in the Proper Orthogonal Decomposition? **SIAM J. Sci. Comput.**, vol. 36 (3), 2014, pp. A1221-A1250

8. T. Iliescu and *Z. Wang*. Variational Multiscale Proper Orthogonal Decomposition: Navier-Stokes Equations. **Numer. Meth. Partial. Diff. Eqs.**, vol. 30, 2014, pp. 641-663

9. T. Iliescu and *Z. Wang*. Variational Multiscale Proper Orthogonal Decomposition: Convection-Dominated Convection-Diffusion Equations. **Math. Comp.**, vol. 82, 2013, pp. 1357-1378

10. E. Foster, T. Iliescu, and *Z. Wang*. A Finite Element Discretization of the Streamfunction Formulation of the Stationary Quasi-Geostrophic Equations of the Ocean. **Comput. Meth. Appl. Mech. Eng.**, vol. 261-262, 2013, pp. 105-117

11. J. Huang, *Z. Wang* and R. Zhu. Asymptotic Error Expansions for Hypersingular Integrals. **Adv. Comput. Math.**, vol. 38 (2), 2013, pp. 257-279

12. *Z. Wang*, I. Akhtar, J. Borggaard and T. Iliescu. Proper Orthogonal Decomposition Closure Models for Turbulent Flows: A Numerical Comparison. **Comput. Meth. Appl. Mech. Eng.**, vol. 237-240, 2012, pp. 10-26

13. O. Roderick, M. Anitescu and *Z. Wang*. Reduced Order Approximations in Uncertainty Analysis of Nuclear Engineering Applications. **Trans. Am. Nucl. Soc.**, vol. 106, 2012

14. I. Akhtar, *Z. Wang*, J. Borggaard and T. Iliescu. Jacobian Based Nonlinear Closure for Reduced-Order Models. **J. Comp. Nonlinear Dynamics**, vol. 7 (3), 034503, 2012

15. P. Cheng, J. Huang, *Z. Wang* and G. Zeng. Nyström Methods and Extrapolation for Solving Steklov Eigensolutions and its Application in Elasticity. **Numer. Meth. Partial. Diff. Eqs.**, vol. 28 (6), pp. 2021-2040, 2012

16. P. Cheng, X. Luo, *Z. Wang* and J. Huang. Mechanical Quadrature Methods and Extrapolation Algorithms for Boundary Integral Equations with Linear Boundary Conditions in Elasticity. **J. Elasticity**, vol. 108 (2), pp. 193-207, 2012

17. W. Feng, X. He, *Z. Wang* and X. Zhang. Non-Iterative Domain Decomposition Methods for a Non-Stationary Stokes-Darcy Model with Beavers-Joseph Interface Condition. **Appl. Math. Comput.**, vol. 219 (2), 2012, pp. 453-463

18. *Z. Wang*, I. Akhtar, J. Borggaard and T. Iliescu. Two-Level Discretizations of Nonlinear Closure Models for Proper Orthogonal Decomposition. **J. Comput. Phys.**, vol. 230 (1), 2011, pp. 126-146

19. J. Borggaard, T. Iliescu and *Z. Wang*. Artificial Viscosity Proper Orthogonal Decomposition. **Math. Comput. Model.**, vol. 53 (1-2), 2011, pp. 269-279

20. O. Roderick, *Z. Wang* and M. Anitescu. Dimensionality Reduction for Uncertainty Quantification of Nuclear Engineering Models. **Trans. Am. Nucl. Soc.**, vol. 104, 2011

21. O. San, A. E. Staples, *Z. Wang* and T. Iliescu. Approximate Deconvolution Large Eddy Simulation of a Barotropic Ocean Circulation Model. **Ocean Modelling**, vol. 40, 2011, pp. 120-132

22. P. Cheng, J. Huang and *Z. Wang*. Mechanical Quadrature Methods and Extrapolation for Solving Nonlinear Boundary Helmholtz Integral Equations. **Appl. Math. Mech. (Eng. Ed.)**, vol. 32 (12), 2011, pp. 1505-1514

23. B. Hu and *Z. Wang*. Combined Hybrid Method Applied in the Reissner-Mindlin Plate Model. **Finite Elem. Anal. Des.**, vol. 46 (5), 2010, pp. 428-437

24. J. Huang and *Z. Wang*. Extrapolation Algorithms for Solving Mixed Boundary Integral Equations of the Helmholtz Equation by Mechanical Quadrature Methods. **SIAM J. Sci. Comput.**, vol. 31 (6), 2009, pp. 4115-4129

25. *Z. Wang* and B. Hu. Research of Combined Hybrid Method Applied in the Reissner-Mindlin Plate Model. **Appl. Math. Comput.**, vol. 182 (1), 2006, pp. 49-66

Proceedings

26. I. Akhtar, *Z. Wang*, J. Borggaard and T. Iliescu. A Novel Strategy for Nonlinear Closure in Proper Orthogonal Decomposition Reduced-Order Models. ASME ECTC October 1-2, 2010, Atlanta, GA

27. I. Akhtar, *Z. Wang*, J. Borggaard and T. Iliescu. Large Eddy Simulation Ideas for Nonlinear Closure in Model Reduction of Fluid Flows. 5th Flow Control Conference June 28-July 1, 2010, Chicago, Illinois, **AIAA 2010-5089**

28. I. Akhtar, J. Borggaard, T. Iliescu and *Z. Wang*. Residual-Based Closure for the Stability of Reduced-Order Models. 48th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition January 4-7, 2010, Orlando, Florida, **AIAA 2010-1276**

29. J. Borggaard, A. Duggleby, A. Hay, T. Iliescu and *Z. Wang*. Reduced-Order Modeling of Turbulent Flows. **In Proceedings of MTNS**, 2008

Grants

- SC Research Foundation, Reduced Order Modeling of Complex Fluid Flows, PI, 05/16/2015-08/15/2016, $13,989.00

- National Science Foundataion, Collaborative Research: Reduced Order Modeling of Realistic Noisy Flows (DMS 1522672), PI, 07/01/2015-06/30/2018, $111,258.00

- Department of Energy, Grid Generation, Coupling Strategies, and Spatially-dependent Time Stepping for OceanÐtidal/Estuary Systems and other ESM Components (DE-SC0016540), Co-PI, 09/01/2016-08/31/2019, $584,495.00

Honors

- SIAM CSE 3rd BGCE Student Paper Prize Finalist, Reno, NV, 2011

- Winner of the 34th SIAM SEAS Conference Student Paper Competition, Raleigh, NC, 2010

- C. B. Ling Scholarship, Virginia Tech, 2008-2009

- Excellent Graduate Medal, Department of Education of Sichuan Province, China, 2006

- First Prize of National Post-Graduate Mathematical Contest in Modeling, China, 2004 and 2005

Departmental Services

- Service on the events committee, 2014 Fall - present

- Service on undergraduate advising for upper division majors, 2014 Fall - present

- Organizer of Applied and Computational Mathematics (ACM) seminar, 2015 Fall - present

Professional Community Services

Review Proposals

- National Science Foundation Focused Research Group in Mathematical Sciences, 2017

- USC ASPIRE track-I program, 2016

Review Papers

- journals: Applied Numerical Mathematics, Computers and Mathematics with Applications, Computers & Fluids, Computer Methods in Applied Mechanics and Engineering, International Journal of Numerical Analysis & Modeling – Series B, International Journal of Numerical Methods in Fluids, International Communications in Heat and Mass Transfer, Journal of Aerospace Engineering, Journal of Inequalities and Applications, Journal of Engineering Mathematics, Numerical Methods for Partial Differential Equations, SIAM Journal on Numerical Analysis

- conferences: 2014 American Control Conference

Guest Editor

- Computers & Mathematics with Applications: for the special issue of 2nd Annual Meeting of SIAM Central States Section (2016).

Co-organized Conferences

- The 2nd Annual Meeting of SIAM Central States Section, Little Rock, AR, September 30–October 2, 2016

Organized/Co-organized Mini-symposia

- Recent Advances in Numerical Methods for Fluid Flow with Applications, The 40th SIAM Southeastern Atlantic Section Conference(SIAM-SEAS), Athens, GA, March 12-13, 2016

- Recent Advances in Numerical Methods for Fluid Flows, 1st SIAM CSS Meeting, Rolla, MO, April 11-12, 2015

- Recent Advances in Numerical Methods for Fluid Flow Problems, AMS Fall Southeastern Sectional Meeting, Greensboro, 2014

- Nonlinear Model Reduction of Complex Flows: Modeling, Analysis, and Computations, SIAM CSE13, Boston, February 25-March 1, 2013

Other Professional Activities

Invited Colloquium/Seminar Talks

- CAM seminar, University of Tennessee, Knoxville, October 12, 2016

- CSE seminar, University of South Carolina, Columbia, SC, September 9, 2016

- Lecture, Shangdong University, Jinan, China, June 2, 2016

- Seminar, Beihang University, Beijing, China, May 31, 2016

- CSRC Seminar, Beijing Computational Science Research Center, China, May 26, 2016

- CSRC Seminar, Beijing Computational Science Research Center, China, July 21, 2015

- Lecture Series on Scientific Computing, Sichuan University, China, July 17, 2015

- Applied Mathematics Seminar, Auburn University, April 17, 2015

- Computational Mathematics Seminar, Clemson University, November 20, 2014

- Computational Mathematics Seminar, University of Pittsburgh, November 11, 2014

- Department of Mathematics, University of South Carolina, December 5, 2013

- Computer Science and Mathematics Division Seminar, Oak Ridge National Laboratory, February 22, 2012

- Farhat Research Group Seminar, Stanford University, February 9, 2012

- Mathematics and Computer Science Division Seminar, Argonne National Laboratory, January 31, 2012

- Computing Sciences Directorate Seminar, Lawrence Berkeley National Laboratory, January 20, 2012

Invited Mini-symposium Talks

- 2017 AMS Spring Southeastern Sectional Meeting, Charleston, March 11, 2017

- 2017 SIAM CSE Meeting, Atlanta, February 28, 2017

- 2016 AMS Fall Southeastern Sectional Meeting, Raleigh, November 12-13, 2016

- 2016 AMS Fall Western Sectional Meeting, Denver, CO, October 9, 2016

- 2nd SIAM CSS Meeting, University of Arkansas, Little Rock, AR, October 1, 2016

- 2016 SIAM Annual Meeting, Boston, MA, July 11, 2016

- 2016 SIAM SEAS Meeting, Athens, GA, March 12, 2016

- 2015 ICIAM, Beijing, China, August 14, 2015

- 2015 SIAM SEAS Meeting, Birmingham, AL, March 20, 2015

- 2014 AMS Fall Southeastern Sectional Meeting, Greensboro, November 8-9, 2014

- 2014 SIAM Annual Meeting (AN14), Chicago, July 7-11, 2014

- The SIAM Conference on Control and Its Applications (CT13), San Diego, July 8-10, 2013

- 2013 SIAM Annual Meeting (AN13), San Diego, July 8-12, 2013

- 2013 SIAM Applications of Dynamical Systems (DS13), Snowbird, May 19-23, 2013

- 2013 SIAM Computational Science and Engineering (CSE13), Boston, February 25-March 1, 2013

- 8th International Purdue Symposium on Statistics, Purdue Statistics, June 23, 2012

- 36th SIAM Southeastern Atlantic Section Conference, Univeristy of Alabama in Huntsvile, March 24, 2012

- AMS Western Section Meeting, Las Vegas, NV, April 30-31, 2011

- 35th SIAM Southeastern-Atlantic Section Conference, Charlotte, NC, March 26-27, 2011

- SIAM Computational Science and Engineering (CSE11), Reno, NV, March 1-5, 2011

Contributed Talks

- IMA Hot Topics Workshop: Mathematical and Computational Challenges in the Control, Optimization, and Design of Energy-Efficient Buildings, June 11-14, 2013

- IMA Postdoc Seminar, IMA, University of Minnesota, February 19, 2013

- SIAM Student Conference 2012, Virginia Tech, March 03, 2012

- 2012 Joint Mathematics Meetings, Boston, January 6, 2012

- Student Argonne Summer Symposium, Argonne National Laboratory, August 2, 2011

- SIAM Student Conference 2011, Clemson University, SC, February 19, 2011

- The 30th Southeastern-Atlantic Regional Conference on Differential Equations, Blacksburg, VA, October 1-2, 2010

- Student Argonne Summer Symposium, Argonne National Laboratory, Argonne, IL, August 4, 2010

- SIAM Annual Meeting (AN10), Pittsburgh, PA, July 12-16, 2010

- 34th SIAM Southeastern-Atlantic Section Conference, Raleigh, NC, March 20-21, 2010

- SIAM Student Conference, Blacksburg, VA, February 20, 2010

- The First VT Symposium on Reduced-Order Modeling and System Identification, Blacksburg, VA, February 15, 2010

- Fall Fluid Mechanics Symposium, Blacksburg, VA, November 10, 2009

- SIAM Conference on Computational Science and Engineering (CSE09), Miami, March 2-6, 2009

- The Clemson/Pitt/UTK/VT graduate/postgraduate SIAM Student Conference, Blacksburg, VA, February 21, 2009

- Project/NExt/Young Mathematician's Network Poster Session, AMS Joint Mathematics Meeting, Washington, DC, January 5-8, 2009