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## Education

- Ph.D in Computational Mathematics: June 2009, Zhejiang University
- B.S. in Information and Computer Science: June 2004, Zhejiang University

## Employment

- Department of Mathematics, University of Bergen, Norway  
*Adjunct Associate Professor:* January 2020 - present
- Department of Mathematics, Tufts University  
*Associate Professor:* July 2019 - present
- Department of Mathematics, Tufts University  
*Assistant Professor:* September 2014 - June 2019
- Department of Mathematics, The Pennsylvania State University  
*Research Assistant Professor:* August 2013 - August 2014
- Department of Mathematics, The Pennsylvania State University  
*Postdoctoral Fellow:* August 2010 - August 2013
- Beijing International Center of Mathematical Research  
*Visiting Scholar:* July 2009 - July 2010
- Department of Mathematics, The Pennsylvania State University  
*Visiting Scholar:* September 2007 - August 2008

## Publications and Manuscripts

### Under Review

1. *Mixed-Dimensional Auxiliary Space Preconditioners*, A. Budiša, W. M. Boon, and **X. Hu**, submitted to SIAM Journal of Scientific Computing, 2019.
2. *Block Preconditioners for Mixed-dimensional Discretization of Flow in Fractured Porous Media*, A. Budiša and **X. Hu**, submitted to Computational Geosciences, 2019.
3. *A Stabilized Hybrid Mixed Finite Element Method for Poroelasticity*, C. Niu, H. Rui, and **X. Hu**, submitted to Computational Geosciences, 2019.
4. *Robust Preconditioners for A New Stabilized Discretization of the Poroelastic Equations*, J. H. Adler, F. J. Gaspar, **X. Hu**, P. Ohm, C. Rodrigo, and L. T. Zikatanov, submitted to SIAM Journal of Scientific Computing, 2019.
5. *Using Hierarchical Matrices in the Solution of the Time-fractional Heat Equation by Multi-grid Waveform Relaxation*, **X. Hu**, C. Rodrigo, and F. J. Gaspar, submitted to Journal of Computational Physics, 2018.

## Refereed Publications

6. *Convergence Analysis of a Generalized Full Approximation Storage Scheme for Convex Optimization Problems*, L. Chen, **X. Hu**, and S. M. Wise, *Mathematics of Computation*, accepted.
7. *Auxiliary space preconditioning for mixed finite element discretizations of Richards' equation*, J. Batista, **X. Hu**, and L. T. Zikatanov, *Computers and Mathematics with Applications*, in press.
8. *Randomized and Fault-tolerant Method of Subspace Corrections*, **X. Hu**, J. Xu, and L. T. Zikatanov, *Research in the Mathematical Sciences*, in press.
9. *The Shifted-inverse Power Weak Galerkin Method for Eigenvalue Problems*, Q. Zhai, **X. Hu**, R. Zhang, *Journal of Computational Mathematics*, in press.
10. *An Adaptive Multigrid Method based on Path Cover*, **X. Hu**, J. Lin, and L. T. Zikatanov, *SIAM Journal of Scientific Computing*, 41(5), S220-S241, 2019.
11. *Modifying AMG Coarse Spaces with Weak Approximation Property to Exhibit Approximation in Energy Norm*, **X. Hu** and P. S. Vassilevski, *SIAM Journal on Matrix Analysis and Applications*, 40(3), 1131-1152, 2019.
12. *A Spatially Adaptive High-order Meshless Method for Fluid-Structure Interactions*, W. Hu, N. Trask, **X. Hu**, and W. Pan, *Computer Methods in Applied Mechanics and Engineering*, 355, 67-93, 2019.
13. *Assessment of network module identification across complex diseases*, S. Choobdar, M. E. Ahlsen, J. Crawford, M. Tomasoni, T. Fang, D. Lamparter, J. Lin, B. Hescott, **X. Hu**, J. Mercer, T. Natoli, R. Narayan, A. Subramanian, J. D. Zhang, G. Stolovitzky, Z. Kutalik, K. Lage, D. K. Slonim, J. Saez-Rodriguez, L. J. Cowen, S. Bergmann, and D. Marbach, *Nature Methods*, 16(9), 843-852, 2019.
14. *An a Posteriori Error Estimator for the Weak Galerkin Least-Squares Finite-Element Method*, J. H. Adler, **X. Hu**, L. Mu, and X. Ye, *Journal of Computational and Applied Mathematics*, 362, 383-399, 2019.
15. *A Weak Galerkin Finite Element Method for the Navier-Stokes Equations*, **X. Hu**, L. Mu, and X. Ye, *Journal of Computational and Applied Mathematics*, 362, 614-625, 2019.
16. *Common Randomized Shortest Paths (C-RSP): A Simple Yet Effective Framework for Multi-View Graph Embedding*, A. Gamage, B. Rappaport, S. Aeron, and **X. Hu**, 2019 IEEE International Conference on Acoustics, Speech, and Signal Processing, ICASSP 2019.
17. *A Consistent Spatially Adaptive Smoothed Particle Hydrodynamics Method for Fluid-Structure Interactions*, W. Hu, G. Guo, **X. Hu**, D. Negrut, Z. Xu, and W. Pan, *Computer Methods in Applied Mechanics and Engineering*, 347, 402-424, 2019.
18. *Anti-myeloma Activity and Molecular Logic Operation by Natural Killer Cells in Microfluidic Droplets*, S. Sarkar, S. McKenny, P. Sabhachandani, J. Adler, **X. Hu**, D. Stroopinski, J. Rosenblatt, D. Avigan, and T. Konry, *Sensors and Actuators B: Chemical*, 282, 580-589, 2019.
19. *Vector-potential Finite-element formulations for Two-dimensional Resistive Magnetohydrodynamics*, J. H. Adler, Y. He, **X. Hu**, and S. P. MacLachlan, *Computers and Mathematics with Applications*, 77(2), 476-493, 2019.
20. *Robust Block Preconditioners for Biot's Model*, J. H. Adler, F. J. Gaspar, **X. Hu**, C. Rodrigo, and L. T. Zikatanov, In *Domain Decomposition Methods in Science and Engineering XXIV*, Lecture Notes in Computational Science and Engineering. Springer-Verlag, 2018.

21. *New Stabilized Discretizations for Poroelasticity and the Stokes' Equations*, C. Rodrigo, **X. Hu**, P. Ohm, J. H. Adler, F. J. Gaspar, and L. T. Zikatanov, *Computer Methods in Applied Mechanics and Engineering*, 341, 467-484, 2018.
22. *Newton Solvers for Drift-Diffusion and Electrokinetic Equations*, A. Bousquet, **X. Hu**, M. Metti, and J. Xu, *SIAM Journal of Scientific Computing*, 40(3), B982-B1006, 2018,
23. *Optimal Interpolation and Compatible Relaxation in Classical Algebraic Multigrid*, J. Brannick, F. Cao, K. Kahl, R. Falgout, and **X. Hu**, *SIAM Journal of Scientific Computing*, 40(3), A1473-A1493, 2018.
24. *A Compatible High-order Meshless Method for the Stokes Equations with Applications to Suspension Flows*, N. Trask, M. Maxey, and **X. Hu**, *Journal of Computational Physics*, 355, 310-326, 2018.
25. *Computing the Diffusion State Distance on Graphs via Algebraic Multigrid and Random Projections*, J. Lin, L. J. Cowen, B. Hescott, and **X. Hu**, *Numerical Linear Algebra with Applications*, 25(3), e2156-e2171, 2018.
26. *Weak Galerkin Method for the Biot's Consolidation Model*, **X. Hu**, L. Mu, and X. Ye, *Computer & Mathematics with Applications*, 75, 2017-2030, 2018.
27. *Multigrid Algorithms for hp-version Interior Penalty Discontinuous Galerkin Methods on Polygonal and Polyhedral meshes*, P. F. Antonietti, P. Houston, **X. Hu**, M. Sarti, and M. Verani, *Calcolo*, 54(4), 1169-1198, 2017.
28. *Robust Solvers for Maxwell's Equations with Dissipative Boundary Conditions*, J. Adler, **X. Hu**, and L. Zikatanov, *SIAM Journal of Scientific Computing*, 39(5), S3-S23, 2017.
29. *Adaptive Finite Element Method for Fractional Differential Equations using Hierarchical Matrices*, X. Zhao, **X. Hu**, W. Cai, and G. Karniadakis, *Computer Methods in Applied Mechanics and Engineering*, 325, 56-76, 2017.
30. *Algebraic Multigrid for Least Squares Problems on Graphs with Applications to HodgeRank*, C. Colley, J. Lin, **X. Hu**, and S. Aeron, *Graph Algorithms Building Blocks, 2017 IEEE International Parallel and Distributed Processing Symposium Workshops (IPDPSW)*, Orlando / Buena Vista, FL, USA, 627-636, 2017.
31. *A Simple Finite Element Method of the Cauchy Problem for Poisson Equation*, **X. Hu**, L. Mu and X. Ye, *International Journal of Numerical Analysis and Modeling*, 14(4-5), 591-603, 2017.
32. *Numerical Studies of A Class of Linear Solvers for Fine-Scale Petroleum Reservoir Simulation*, Z. Li, S. Wu, C.-S. Zhang, J. Xu, C. Feng, and **X. Hu**, *Computing and Visualization in Science*, 18(2), 93-102, 2017.
33. *A Nonconforming Finite Element Method for the Biot's Consolidation Model in Poroelasticity*, **X. Hu**, C. Rodrigo, J. Gaspar, and L. Zikatanov, *Journal of Computational and Applied Mathematics*, 310, 143-154, 2017.
34. *On the Approximation of Laplacian Eigenvalues in Graph Disaggregation*, **X. Hu**, J. C. Urschel and L. Zikatanov, *Linear and Multilinear Algebra*, 65(9), 1805-1822, 2017.
35. *Compact Moving Least Squares: An Optimization Framework for Generating High Order Compact Meshless Discretizations*, N. Trask, M. Maxey, and **X. Hu**, *Journal of Computational Physics*, 326, 596-611, 2016.
36. *Robust Preconditioners for Incompressible MHD Models*, Y. Ma, K. Hu, **X. Hu**, and J. Xu, *Journal of Computational Physics*, 316, 721-746, 2016.

37. *A Two-grid SA-AMG Convergence Bound that Improves When Increasing the Polynomial Degrees*, **X. Hu**, P. Vassilevski, and J. Xu, Numerical Linear Algebra with Applications, 23(4), 746-771, 2016.
38. *Fast Multilevel Solvers for A Class of Discrete Fourth Order Parabolic Problems*, B. Zheng, L.P. Chen, **X. Hu**, L. Chen, R.H. Nochetto, and J. Xu, Journal of Scientific Computing, 69(1), 201-226, 2016.
39. *Stability and Monotonicity for Some Discretizations of the Biot's Consolidation Model*, C. Rodrigo, J. Gaspar, **X. Hu**, and L. Zikatanov, Computer Methods in Applied Mechanics and Engineering, 298(1), 183-204, 2016.
40. *On Robust and Efficient Parallel Reservoir Simulation on Tianhe-2*, W. Guan, C. Qiao, H. Zhang, C.-S. Zhang, M. Zhi, Z. Zhu, Z. Zheng, W. Ye, Y. Zhang, **X. Hu**, Z. Li, C. Feng, Y. Xu, and J. Xu, SPE Reservoir Characterization and Simulation Conference and Exhibition, SPE 175602-MS, 2015.
41. *A Finite Element Framework for Some Mimetic Finite Difference Discretizations*, with C. Rodrigo, F.J. Gaspar, **X. Hu**, and L. Zikatanov, Computers & Mathematics with Applications, 70(11), 2661-2673, 2015.
42. *A Cascadic Algorithm for Computing the Fiedler Vector of Graph Laplacians*, J. Urschel, J. Xu, **X. Hu**, and L. Zikatanov, Journal of Computational Mathematics, 33(2), 209-226, 2015.
43. *A Multigrid Solver based on Distributive Smoother and Defect Correction for Oseen Problems*, L. Chen, **X. Hu**, M. Wang, and J. Xu, Numerical Mathematics: Theory, Methods and Applications, 8(2), 237-252, 2015.
44. *Local Fourier Analysis of Multigrid Methods with Polynomial Smoothers and Aggressive Coarsening*, J. Brannick, **X. Hu**, C. Rodrigo, and L. Zikatanov, Numerical Mathematics: Theory, Methods and Applications, 8(1), 1-21, 2015.
45. *Two-Grid Method for Maxwell Eigenvalue Problems*, J. Zhou, **X. Hu**, L. Chen, S. Shu, and L. Zhong, SIAM Journal on Numerical Analysis, 52(4), 2027-2047, 2014.
46. *On Adaptive Eulerian-Lagrangian Method for Linear Convection-Diffusion Problems*, **X. Hu**, Y.-J. Lee, J. Xu, and C.-S. Zhang, Journal of Scientific Computing, 58(1), 90-114, 2014.
47. *Application of Auxiliary Space Preconditioning in Field-Scale Reservoir Simulations*, **X. Hu**, J. Xu and C.-S. Zhang, SCIENCE CHINA Mathematics, 56(12), 2737-2751, 2013.
48. *A Parallel Auxiliary Grid Algebraic Multigrid Method for Graphic Processing Units*, L. Wang, **X. Hu**, J. Cohen, and J. Xu, SIAM Journal on Scientific Computing, 35(3), C263-C283, 2013.
49. *Combined Preconditioning with Applications in Reservoir Simulation*, **X. Hu**, S. Wu, X. Wu, J. Xu, C.-S. Zhang, S. Zhang, and L. Zikatanov, Multiscale Modeling and Simulation, 11(2), 507-521, 2013.
50. *Parallel Unsmoothed Aggregation Algebraic Multigrid Algorithms on GPUs*, J. Brannick, Y. Chen, **X. Hu**, and L. Zikatanov, Proceedings of Symposium in honor of Raytcho Lazarov's 40 years research in Computational Methods and Applied Mathematics, Springer Proceedings in Mathematics and Statistics, Vol. 45, 2013.
51. *Comparative Convergence Analysis of Nonlinear AMLI-cycle Multigrid*, **X. Hu**, P. Vassilevski, and J. Xu, SIAM Journal on Numerical Analysis, 51(2), 1349-1369, 2013.
52. *Development of a Fast Auxiliary Subspace Preconditioner for Numerical Reservoir Simulators*, **X. Hu**, W. Liu, G. Qin, J. Xu, Y. Yan, and C.-S. Zhang, SPE Reservoir Characterization and Simulation Conference and Exhibition, SPE 148388, 2011.

53. *Acceleration of Two-grid Method for Eigenvalue Problems*, **X. Hu** and X.-L. Cheng, Mathematics of Computation, 80, No. 275, 1287-1301, 2011.
54. *Effects of Integrations and Adaptivity for the Eulerian–Lagrangian Method*, J.-W. Jia, **X. Hu**, J. Xu and C.-S. Zhang, Journal of Computational Mathematics, 29, 367-395, 2011.
55. *The Boundary Penalty Method for the Diffusion Equation Subject to the Specification of Mass*, **X. Hu**, L. Zhao and A. W. Shaikh, Applied Mathematics and Computation, 186(1), 735-748, 2007.
56. *Preconditioners for Elliptic Problems via Nonuniform Meshes*, **X. Hu** and X.-F. Ling, Applied Mathematics and Computation, 181(2), 1182-1198, 2006.
57. *On the Iterative Algorithm for Large Sparse Saddle Point Problems*, X.-F. Ling and **X. Hu**, Applied Mathematics and Computation, 178(2), 372-379, 2006.

### Proceedings

58. *A Drift-Diffusion Solver Using a Finite-Element Method to Analyze Carrier Dynamics at Ultra-high Solar Concentrations*, E. Carlson, M. Stevens, D. Emerson, **X. Hu**, J. H. Adler, and T. E. Vandervelde, In Proceedings of the 60th IEEE International Midwest Symposium on Circuits and Systems Conference, Boston, August 6th-9th, 2017.

### Technical Reports

59. *Microphysics of Neutron Star Outer Envelopes in the Periodized, Magnetic Thomas-Fermi Model*, T.A. Engstrom, V.H. Crespi, B.J. Owen, J. Brannick, and **X. Hu**, arXiv:1409.3299 [astro-ph.SR], 24 February, 2015.

### In Preparation

60. *Ladder Polynomial Neural Networks*, L. Liu, R. Gu, and **X. Hu**, in preparation.
61. *A New Simple Adaptive Finite Element Method for Eigenvalue Problems*, J. Hu, **X. Hu**, H. Wei, N. Yi, in preparation.
62. *Randomized Fast Subspace Descent Methods*, L. Chen, **X. Hu**, and H. Wu, in preparation.
63. *Diffusion State Distances: Multitemporal Analysis, Low-dimensional Representations, and Fast Algorithms*, L. Cowen, K. Devkota, **X. Hu**, J. M. Murphy, and K. Wu, in preparation.

### Grants

1. NSF Grant (MATHBIO), *Mining Multi-Layer Protein-Protein Association Network: An Integrated Spectral Approach*, 09/01/2018 - 08/31/21, Co-PI with L. Cowen (PI),
2. Tufts Collaborates, *Elimination of Surfactant-Induced Flow Resistance in Superhydrophobic Microchannels*, 09/01/2018 - 05/31/19, Co-PI with M. Hodes (PI) and J. Adler (Co-PI).
3. NSF Grant, *Robust Solvers for Coupled Problems with Applications to Electromagnetism and Poromechanics*, 09/15/2016 - 08/31/2019, PI.
4. DOE Grant (ASCR), *Collaboratory on Mathematics for Mesoscopic Modeling of Materials*, 11/01/2012 - 10/31/2014, Co-PI. with J. Xu (PI).
5. NSF Grant, *Collaborative Research: Special Session on Numerical Modeling of Fluids and Structures*, 05/01/2013 - 09/01/2013, PI.

### Honors and Awards

- 2016: Best Performer of Disease Module Identification DREAM Challenges (Team Tusk: Jake Crawford, Junyuan Lin, Xiaozhe Hu, Benjamin Hescott, Donna Slonim, Lenore Cowen)
- 2016: Reimann-Louville Award for Best Application Paper at the International Conference on Fractal Differentiation and Its Applications 2016 (paper title: “*Fast Solver for Fractional Differential Equations based on Hierarchical Matrices*”)
- 2009: Outstanding Ph.D. Graduate of Zhejiang Province, Department of Education, China
- 2009: Outstanding Ph.D. Graduate of Zhejiang University, Zhejiang University
- 2004: Samsung Scholarship Award, Samsung Corporation

## Invited Talks

1. *Robust Preconditioners for Mixed-dimensional Models of Flow in Fractured Porous Media*, Kalvåg Workshop: Analysis and Computation of Coupled Problems, Kalvåg, Norway, 11/29/2019.
2. *Spectral Graph Distance for Biological Networks*, 2019 Internatinal Multigrid Conference, Kunming, China, 08/13/2019.
3. *Multilevel Iterative Methods for Discretized Partial Differential Equations*, State Key Laboratory of CAD & CG, Zhejiang University, Hangzhou, China, 08/09/2019.
4. *Stable Discretizations and Robust Preconditioners for Poroelasticity*, School of Mathematics, Southeast University, Nanjing, China, 08/06/2019.
5. *Robust Preconditioners for Mixed-dimensional Models of Flow in Fractured Porous Media*, InterPore2019, 11th Annual Meeting, Valencia, Spain, 05/07/2019.
6. *Robust Preconditioners for Mixed-dimensional Models of Flow in Fractured Porous Media*, AMS Spring Central and Western Joint Sectional Meeting, Hawaii, 03/22/2019.
7. *Stable Discretizations and Robust Preconditioners for the Biot’s Model*, SIAM Conference on Computational Science and Engineering, Spokane, Washington, 02/27/2019.
8. *Robust Preconditioners for the Biot’s Model*, SIAM Conference on Life Sciences, Minneapolis, 08/09/2018.
9. *Adaptive Multilevel Finite Element Method for Fractional Differential Equations using Hierarchical Matrices*, Fractional PDEs: Theory, Algorithm and Applications, ICERM, 06/22/2018.
10. *Stable Discretizations and Robust Preconditioners for the Biot’s Model*, The Computational Mathematics Aspects of Porous Media and Fluid Flow, Lorentz Center, Leiden, Netherlands, 05/22/2018.
11. *Adaptive Multilevel Finite Element Method for Fractional Differential Equations using Hierarchical Matrices*, Computational and Applied Mathematics Seminar, Mississippi State University, 03/23/2018.
12. *Robust Discretization and Preconditioners for the Biot’s Model*, Workshop on Solvers for Materials with High-Aspect-Ratio Inclusions, Finse, Norway, 01/09/2018.
13. *Adaptive Multilevel Finite Element Method for Fractional Differential Equations using Hierarchical Matrices*, Mathematical Sciences Colloquium, Worcester Polytechnic Institute, 11/10/2017.
14. *Robust Preconditioners for the Biot’s Model*, European Conference on Numerical Mathematics & Advanced Applications, Voss, Norway, 09/26/2017.
15. *Algebraic Multigrid Methods for Computing Diffusion State Distance on Graphs*, ICMSEC Seminar, Chinese Academy of Sciences, Beijing, China, 08/09/2017.

16. *Adaptive Multilevel Finite Element Method for Fractional Differential Equations using Hierarchical Matrices*, 2017 PKU Summer Activities on Numerical Methods for PDEs, Peking University, Beijing, China, 07/24/2017.
17. *Algebraic Multigrid Methods for Computing Diffusion-based Metrics on Graphs*, 2017 SIAM Annual Meeting, Pittsburgh, 07/13/2017.
18. *Efficient Solvers for Mimetic Finite Difference Method for Maxwell's Equations*, Polytopal Element Methods in Mathematics and Engineering, University of Milano-Bicocca, Milano, Italy, 07/05/2017.
19. *Robust Preconditioners for Coupled Problems*, MAC Seminar, Centrum Wiskunde & Informatica, Amsterdam, Netherlands, 06/13/2017.
20. *Robust Preconditioners for Coupled Problems*, Seminario Rubio de Francia, Universidad de Zaragoza, Zaragoza, Spain, 06/01/2017.
21. *Algebraic Multigrid Methods for Computing Diffusion State Distance on Graphs*, Maseeh Mathematics & Statistics Colloquium, Portland State University, Portland, 05/05/2017.
22. *Algebraic Multigrid Methods for Computing Diffusion-Based Metrics on Graphs*, Computational Science Seminar, University of Massachusetts Dartmouth, 04/12/2017.
23. *Efficient Simulation of Asymptotically Disappearing Solutions for Wave Equations*, SIAM conference on Computational Science and Engineering, Atlanta, 02/28/2017.
24. **Plenary talk:** *Robust Preconditioners for Coupled Problems*, The 24th International Conference on Domain Decomposition Methods, Svalbard, Norway, 02/07/2017.
25. *Fast Graph Laplacian Solvers and Their Applications in Protein Interaction Networks*, Applied and Computational Mathematics Seminar, University of California, Irvine, 12/05/2016.
26. *Fast Graph Laplacian Solvers and Their Applications*, CCMA Colloquium, The Pennsylvania State University, 11/28/2016.
27. *Distance Metrics for Protein Interaction Networks*, CCMA Luncheon Seminar, The Pennsylvania State University, 11/28/2016.
28. *Weak Galerkin Finite Element Method for the Biot's Consolidation Model*, The 2nd Annual Meeting of SIAM Central States Section, University of Arkansas at Little Rock, 10/01/2016.
29. *Randomized Method of Subspace Corrections*, CCMA PDEs and Numerical Methods Seminar, The Pennsylvania State University, 06/28/2016.
30. *Nonconforming Three-field Discretization of Biot's Model in Poroelasticity*, 8th International Conference on Porous Media & Annual Meeting, Cincinnati, Ohio, USA, 05/09/2016.
31. *Convergence Analysis of Finite Element Discretizations for Biot's Equations*, Workshop "Flow in Deformable Porous Media", Universidad de Zaragoza, 11/25/2015.
32. *Finite Element Multigrid Framework for Mimetic Finite Difference Discretizations*, Polytopal Element Methods in Mathematics and Engineering, Georgia Institute of Technology, October 28, 2015.
33. *Effective Solvers for Reservoir Simulation*, SIAM Conference on Mathematical and Computational Issues in the Geosciences, Stanford University, 06/29/2015.
34. *Algebraic Multigrid Method and Its Parallelization*, Computational Science Seminar, University of Massachusetts Dartmouth, 04/29/2015.
35. *Cascadic Multigrid for Eigenvalue Problems and Its Application in Graph Problems*, Mathematics Colloquium, Tufts University, 04/17/2015.

36. *Robust Preconditioners for the Incompressible MHD System*, Scientific Computing Seminar, Brown University, 03/27/2015.
37. *Finite Element Multigrid Framework for Mimetic Finite Difference Discretizations*, SIAM Conference on Computational Science and Engineering, Salt Lake City, 03/14/2015.
38. *On Adaptive Eulerian-Lagrangian Method for Linear Convection-Diffusion Problems*, AMS Spring Central Sectional Meeting, Texas Tech University, 04/12/2014.
39. *Effective Solvers for Reservoir Simulation*, Tufts University, 02/12/2014.
40. *Effective Solvers for Reservoir Simulation*, Lawrence Livermore National Laboratory, 11/25/2013.
41. *Cascadic Multigrid for Eigenvalue Problems and Its Application in Graph Problems*, Applied and Computational Mathematics Seminar, University of California, Irvine, 09/20/2013.
42. *Parallel AMG Method on GPU*, 21st International Domain Decomposition Conference, INRIA, Rennes, France, 06/26/2012.
43. *Parallel Auxiliary Grid AMG Method for GPU*, Applied and Computational Mathematics Seminar, University of California, Irvine, 05/07/2012.
44. *Algebraic Multigrid Methods for Petroleum Reservoir Simulation*, 8th International Conference on Scientific Computing and Applications, University of Nevada, Las Vegas, 04/03/2012.
45. *Effective Preconditioners for Reservoir Simulation*, Computational and Applied Mathematics Colloquium, Department of Mathematics, The Pennsylvania State University, 01/13/2012.
46. *Effective Solvers for Reservoir Simulation*, Workshop 4: Numerical Analysis of Multiscale Problems & Stochastic Modeling, Linz, Austria, 12/14/2011.
47. *Effective Solvers for Reservoir Simulation*, Numerical Analysis and PDE Seminar, Department of Mathematics, University of Delaware, 11/10/2011.
48. *Comparative Convergence Analysis of Nonlinear AMLI-cycle Multigrid*, 8th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, 06/07/2011.
49. *Fast Solvers for Reservoir Simulation*, 20th International Domain Decomposition Conference, University of California, San Diego, USA, 02/08/2011.

## Contributed Talks

1. *Robust Preconditioners for Mixed-dimensional Models of Flow in Fractured Porous Media*, Preconditioning 2019, Minneapolis, 07/02/2019.
2. *Subspace Descent Method*, The 12th International Conference on Large-scale Scientific Computations, Sozopol, Bulgaria, 06/11/2019.
3. *Convergence Analysis of the Full Approximation Storage for Nonlinear Problems*, The 25th International Domain Decomposition Conference, Newfoundland, Canada, 07/23/2018.
4. *Convergence Analysis of the Full Approximation Scheme for Nonlinear Problems*, The 15th Copper Mountain Conference on Iterative Methods, 03/27/2018.
5. *Efficient Simulation of Asymptotically Disappearing Solutions for Wave Equations*, The 11th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, 06/05/2017.
6. *Algebraic Multilevel Methods for Computing Diffusion-Based Metrics on Graphs*, The 18th Copper Mountain Conference on Multigrid Methods, 03/30/2017.
7. *Finite Element Framework for Mimetic Finite Difference Discretizations*, 2016 SIAM Annual Meeting, Boston, 07/13/2016.
8. *Efficient Solvers for Asymptotically Disappearing Solutions of Maxwell's Equations*, The 14th Copper Mountain Conference on Iterative Methods, 03/22/2016.



9. *Convergence Analysis of Finite Element Discretizations for Biot's Equations*, The 8th International Congress on Industrial and Applied Mathematics, 08/11/2015.
10. *Convergence Analysis of Finite Element Discretizations for Biot's Equations*, The 10th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria, 06/09/2015.
11. *Adaptive Eulerian-Lagrangian Method for Convection-Diffusion Problems*, Finite Element Circus, University of Delaware, 10/19/2013.
12. *Comparative Convergence Analysis of Nonlinear AMLI-cycle Multigrid*, Finite Element Circus, Rutgers University, New Jersey, 04/14/2012.
13. *Adaptive Eulerian-Lagrangian Method for Convection-Diffusion Problems*, Workshop on Multi-level and Adaptive Methods, Beijing International Center of Mathematical Research & Peking University, Beijing, China, 08/29/2009.

## Professional Service

- Editorial Board:
  - Petroleum Science, 2015 - present
  - Numerical Linear Algebra and Applications, 2018 - present
- Referee for Various Journals: e.g. SIAM Journal on Numerical Analysis (SINUM), SIAM Journal on Scientific Computing (SISC), SIAM Journal on Matrix Analysis and Application (SIMAX), Multiscale Modeling and Simulation (MMS), Mathematics of Computation (Math. Comp.), Numerische Mathematik (Num. Math.), Computer Methods in Applied Mechanics and Engineering (CMAME), Numerical Linear Algebra and Applications (NLAA), Journal of Computational Physics (JCP), Mathematical Models and Methods in Applied Sciences (M3AS), Applicable Analysis (AA), Advances in Applied Mathematics and Mechanics (AAMM), Advances in Computational Mathematics (ACOM), Applied Mathematical Modeling (AMM), BIT Numerical Mathematics (BITN), Computers and Mathematics with Applications (CAMWA), International Journal of Computer Mathematics (IJCM), Journal of Computational and Applied Mathematics (JCAM), Journal of Numerical Methods of Partial Differential Equations (NMPDE), Petroleum Science (PetroSci), and other proceeding journals.
- Reviewer for Department of Energy:
  - DOE office of Advanced Scientific Computing Research, 2012 - present
- Reviewer for Swiss National Science Foundation: 2018
- Scientific Committee Member:
  - 12th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria. 06/10/2019 - 06/14/2019
  - 11th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria. 06/05/2017 - 06/09/2017
  - 10th International Conference on Large-Scale Scientific Computations, Sozopol, Bulgaria. 06/08/2015 - 06/12/2015
- Summer School Organizer:
  - Summer School on Finite Element Methods, 08/04/2015 - 08/07/2015, Beijing Center for Scientific and Engineering Computing, Beijing University of Technology, Beijing, China
- Workshop Organizer:
  - Workshop on Finite Element Methods, 08/08/2015 - 08/09/2015, Beijing Center for Scientific and Engineering Computing, Beijing University of Technology, Beijing, China

- Minisymposium Organizer:

- *Recent Advances in Multigrid Methods and Their Applications*, Preconditioning 2019, 07/01/2019-07/03/2019, Minneapolis, Minnesota, USA.
- *Large Scale Machine Learning: Multiscale Algorithms and Performance Guarantees*, 12th International Conference on Large-Scale Scientific Computations, 06/10/2019-06/14/2019, Sozopol, Bulgaria.
- *Recent Advances in Numerical Methods for Flow in Deformable Porous Media*, 12th International Conference on Large-Scale Scientific Computations, 06/10/2019-06/14/2019, Sozopol, Bulgaria.
- *Recent Advances in Multilevel Solvers*, 2019 SIAM Conference on Computational Science and Engineering, 02/25/2019-03/01/2019, Spokane, Washington, USA.
- *Development of Multigrid Methods for Coupled Physics Applications*, the 25th International Conference on Domain Decomposition Methods, 07/23/2018-07/27/2018, Newfoundland, Canada.
- *Novel Numerical Methods for Multiphysics Problems*, The 3rd Annual Meeting of SIAM Central States Section, 09/29/2017-10/01/2017, Fort Collins, Colorado, USA.
- *Advanced Discretizations and Solvers for Coupled Systems of Partial Differential Equations*, 11th International Conference on Large-Scale Scientific Computations, 06/05/2017-06/10/2017, Sozopol, Bulgaria.
- *Novel Numerical Methods for Maxwells Equations and Magnetohydrodynamics*, 2017 SIAM Conference on Computational Science and Engineering, 02/27/2017-03/03/2017, Atlanta, USA.
- *Robust Solvers for Multiphysics Problems*, the 24th International Conference on Domain Decomposition Methods, 02/06/2017-02/10/2017, Svalbard, Norway
- *Novel Numerical Methods on Polyhedral Meshes*, 2016 SIAM Annual Meeting, 07/11/2016-07/16/2016, Boston, USA.
- *Numerical Simulations in Poromechanics*, 8th International Congress on Industrial and Applied Mathematics, 08/10/2015-08/14/2015, Beijing, China.
- *Numerical Methods for Multiphysics Problem*, 10th International Conference on Large-Scale Scientific Computations, 06/08/2015 - 06/12/2015, Sozopol, Bulgaria.
- *Numerical Modeling of Fluids and Structures*, 9th International Conference on Large-Scale Scientific Computations, 06/03/2013 - 06/07/2013, Sozopol, Bulgaria.

## Tufts Service

- Member of Faculty Research Support Advisory Committee: Tufts University, October 2018-2019.
- Member of School of Engineering Curriculum Committee: School of Engineering, Tufts University, 2017-Present.
- Faculty Advisor for SIAM Student Chapter: Department of Mathematics, Tufts University, June 2015- July 2019.
- Member of Academic Review Board: School of Arts and Sciences, Tufts University, 2014-Present.
- Course Assignment Committee Member: Department of Mathematics, Tufts University, 2018.
- Graduate Committee Member: Department of Mathematics, Tufts University, 2014-Present.

## Advising

- **Ph.D. Students:** Junyuan (Joanne) Lin (Tufts University, 2014 - 2019), Peter Ohm (Tufts University, 2015 - present), Casey Cavanaugh (Tufts University, 2016 - present), Anca Andrei (Tufts University, 2018 - present), Kaiyi Wu (Tufts University, 2018 - present), Michael Mayer (Mechanical Engineering, Tufts University, 2018 - present)
- **Master Students:** Charles Colley (Master, Tufts University, 2016 - 2018), Yue Shen (Master, Tufts University, 2017 - 2019)
- **Undergraduate Students:** Charles Colley (Senior Honors Thesis, Tufts University, 2015 - 2016), Hanyao Zhang (Senior Honors Thesis, Tufts University, 2015 - 2016), Zian Jiang (Tufts University, 2017 - present) Phong Hoang (Tufts University, 2018 - present) Taoli Shen (Tufts University, 2019 - present)
- **Senior Honors Thesis Committee Member:** Anuththari Gamage (Electrical and Computer Engineering, Tufts University, 2018)
- **Master Dissertation Defense Committee Member:** Michael Mayer (Mechanical Engineering, Tufts University, 2018), Samuel Polk (Tufts University 2018), Daniel Dinjian (Computer Science, Tufts University, 2019)
- **Doctoral Dissertation Defense Committee Member:** David Emerson (Tufts University, 2015), Thomas Berson (Tufts University, 2015), Meghan O'Connell (Tufts University, 2016), Qiong Wu (Tufts University, 2016), Jiani Zhang (Tufts University, 2017), Melody Takeuchi (Tufts University, 2017), Xiao Xiao (Mechanical Engineering, Tufts University, 2017), Jie Li (Tufts University, 2018), Hiroshi Otomo (Tufts University, 2018), Hongyan Wang (Tufts University, 2019), Hao Cui (Computer Science, Tufts University, 2019), Liangchun Xu (Mechanical Engineering, Tufts University, 2020)
- **Major Advising:**
  - Class of 2022: Theogene Micomyiza (Computer Science, Applied Mathematics)
  - Class of 2021: Sean Kumar (Applied Mathematics, Economics); Joshua Schellinger (Applied Mathematics)
  - Class of 2020: Sebastian Coates (Computer Science, Applied Mathematics, Minor in Music); Rose Smith (Applied Mathematics, Minor in Finance)
- **Pre-Major Advising:**
  - 2017: Jeremy Arbesfeld; Zachary Bernstein; Sean Kumar; Bo Lan; Matthew Oh; Joshua Schellinger; William Scott; Jacob Shrader
  - 2018: Avery Abel; Camille Anderson; Andrea Boe; Reed Kass-Mullet; Santiago Martinez-Moure; Robert Nooney; Max Price; Tom Reynolds; Daniel Saias; Meredith Schwartz

## Teaching Experiences

- Spring 2020, Tufts University, MATH 226: *Numerical Linear Algebra*
- Fall 2019, Tufts University, MATH 225: *Numerical Analysis*
- Fall 2019, Tufts University, MATH 34: *Calculus II*
- Spring 2019, Tufts University, MATH 252: *PDE II*
- Fall 2018, Tufts University, MATH 150: *Numerical Optimization*
- Fall 2018, Tufts University, MATH 34: *Calculus II (Coordinator)*
- Spring 2018, Tufts University, MATH 250: *Graph Algorithms*
- Spring 2018, Tufts University, MATH 34: *Calculus II (Coordinator)*

- The 2017 Tsinghua Mathcamp, Computational Mathematics, 07/16/2017 - 08/13/2017, Tsinghua University, Beijing, China
- Fall 2017, Tufts University, MATH 150: *Numerical Optimization*
- Spring 2016, Tufts University, MATH 250: *Graph Algorithms*
- Spring 2016, Tufts University, MATH 34: *Calculus II*
- Fall 2015, Tufts University, MATH 226: *Numerical Analysis*
- Fall 2015, Tufts University, MATH 34: *Calculus II*
- Spring 2015, Tufts University, MATH 128: *Numerical Linear Algebra.*
- Spring 2015, Tufts University, MATH 34: *Calculus II.*
- Fall 2014, Tufts University, MATH 126: *Numerical Analysis.*
- Fall 2012, Penn State University, MATH 441: *Matrix Algebra.*
- Spring 2012, Penn State University, MATH/CMPSC 456: *Introduction of Numerical Analysis II.*
- Fall 2011, Penn State University, MATH/CMPSC 455: *Introduction of Numerical Analysis I.*
- Spring 2011, Penn State University, MATH/CMPSC 451: *Numerical Computations.*
- Fall 2010, Penn State University, MATH 250: *Ordinary Differential Equations.*