

Lin Mu

Householder Fellow

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Employment

- **Research Associate** at Mathematics Department and SimCenter,
University of Tennessee at Chattanooga Nov. 2017-Present
- **Householder Fellowship** at Computer Science and Mathematics Division,
Oak Ridge National Laboratory Sep. 2015-Present
- **Visiting Assistant Professor** at Department of Mathematics, Michigan State University
Mentor: Professor Guowei Wei Sep. 2012-Aug. 2015

Education

- **University of Arkansas at Little Rock** Little Rock, AR
Ph.D in Applied Science Aug. 2009 – May. 2012
– Advisor: Professor Xiu Ye
- **Xi'an Jiaotong University** Xi'an, Shaanxi, China
M.Sc in Computational Mathematics Sep. 2006 – June. 2009
– Advisor: Professor Yinnian He
- **Xi'an Jiaotong University** Xi'an, Shaanxi, China
B.Sc in Information and Computational Science Sep. 2002 – June. 2006

Experience

- **Teaching Experience:**
 - MTH 234 **Multivariable Calculus** (Fall 2013 and Fall 2014) at Michigan State University;
 - MTH 124 **Applied Calculus** (Spring 2013) at Michigan State University;
 - MATH 3322 **Differential Equation** (Fall 2010 and Summer 2011) at University of Arkansas at Little Rock;
 - MATH 1452 **Calculus II** (Fall 2012) at University of Arkansas at Little Rock
- **Teaching Assistant:**
 - Teaching Assistant of Calculus I (Spring 2010) at University of Arkansas at Little Rock
 - Teaching Assistant of Partial Differential Equation (Fall 2008) at Xi'an Jiaotong University
- **Research Assistant:** Aug. 2009-May. 2012 at University of Arkansas at Little Rock

Grants

- LDRD (ID: 8958): A Fully Kinetic Exascale Simulation Capability for Magnetic Fusion Energy, CoPI, 2018-2019, 0.4FTE/Year-92k/Year.
- LDRD (ID: 8776): Advanced Numerical Methods for Fracture Modeling, CoPI, 2018-2019, 0.35FTE/Year.
- Department of Energy (DOE): Advanced Scientific Computing Research, Householder Fellowship, Novel Mathematical and Computational Modeling for Maxwell's problems in Dispersive Media, Principal investigator (PI), 2015-2018, 137k/2018.
- National Science Foundation (NSF): Weak Galerkin Modeling of Wave Scattering and Propagation in Dispersive Media, DMS-1418973, Principal investigator (PI), 2014-2015. (Regular 3 year grant but terminated earlier because I moved to a federal lab.)

Research Interest

- Applied Mathematics, Numerical Analysis and Scientific Computing
- Theory and Application of Finite Element Methods, Adaptive Methods, Mixed Finite Element Methods, A Posteriori Error Estimations
- Weak Galerkin finite element methods
- Multiscale finite element methods
- Application of Mathematical techniques to chemistry, biology and material sciences

Synergistic Activities

- **Reviewer of National Science Foundation (NSF) Panel**, Computational Mathematics, 2016
- **Minisymposium organizer**, Novel Numerical Methods on Polyhedral Meshes, SIAM Annual Meeting, 2016; Novel Numerical Methods for Multiphysics Problems, SIAM Central States Section, 09/29-10/01, 2017.
- **Referee for Various Journals**: SIAM Journal on Numerical Analysis (SINUM), Computers and Mathematics with Applications (CAMWA), Journal of Computational and Applied Mathematics (JCAM), International Journal of Heat and Mass Transfer (HMT), Applied Mathematics and Computation (AMC), International Journal for Numerical Methods in Biomedical Engineering (CNM), International Journal of Computational Methods (IJCM), Journal of Computational Mathematics (JCM), Journal of Computational Physics (JCP), Mathematical Methods in the Applied Sciences (MMA), Numerical Methods for Partial Differential Equations (NMPDE), Journal of Nonlinear Analysis (NON), Research in the Mathematical Sciences (RMSS).

Publications

Refereed Publications

Multiscale Modeling

1. Z. Chen, L. Liu, **L. Mu**. DG-IMEX Stochastic Galerkin Schemes for Linear Transport Equation with Random Inputs and Diffusive Scalings. *Journal of Scientific Computing*, 73 (2017): 566-592.

2. R. Wang, **L. Mu**, X. Ye. A Locking Free Reissner-Mindlin Element with Weak Galerkin Rotations. *Discrete and Continuous Dynamical Systems -B*, 2017: DOI: 10.3934/dcdsb.2018086.
3. **L. Mu**, J. Wang, and X. Ye. A weak Galerkin Generalized Multiscale Finite Element Method. *Journal of Computational and Applied Mathematics*, 305 (2016): 68-81.

Polygonal Finite Element

4. H. Li, **L. Mu**, X. Ye. Interior Energy Estimates for the Weak Galerkin Finite Element Method. *Numerische Mathematik*, 139 (2018): 447-478.
5. **L. Mu**, J. Wang, and X. Ye. A Least-squares Based Weak Galerkin Finite Element Method for Second Order Elliptic Equations, *SIAM J. Sci. Comput.*, 39(2017): A1531-A1557.
6. **L. Mu**, J. Wang, X. Ye, and S. Zhang. A Discrete Divergence Free Weak Galerkin Finite Element Method for the Stokes Equations. *Applied Numerical Mathematics*, 125 (2018):172-182.
7. **L. Mu**, J. Wang, and X. Ye. A Weak Galerkin Method for the Reissner-Mindlin Plate in Primary Form. *Journal of Scientific Computing*, 75 (2018): 782-802.
8. **L. Mu**, and X. Ye. A Simple Finite Element Method for Linear Hyperbolic Equation. *Journal of Computational and Applied Mathematics*, 330 (2018): 330-339.
9. X. Hu, **L. Mu**, X. Ye. A Simple Finite Element Method of the Cauchy Problem for Poisson Equation. *International Journal of Numerical Analysis and Modeling*, 14 (2017), N4-5, 591-603.
10. X. Hu, **L. Mu**, X. Ye. Weak Galerkin Method for the Biot's Consolidation Model. *Computers and Mathematics with Applications*, (75) 2018: 2017-2030.
11. **L. Mu**, J. Wang, and X. Ye. Effective Implementation of the Weak Galerkin Finite Element Methods for the Biharmonic Equation. *Computers & Mathematics with Applications*, 74 (2017): 1215-1222.
12. **L. Mu**, X. Ye. A Simple Finite Element Method for the Stokes Equations. *Advances in Computational Mathematics*, 43 (2017): 1305-1324.
13. **L. Mu**, X. Ye. A Simple Finite Element Method for Non-divergence form Elliptic Equations. *International journal of Numerical Analysis and Modeling*, 14 (2017): 306-311.
14. **L. Mu**, J. Wang, X. Ye, and S. Zhao. A new weak Galerkin finite element method for elliptic interface problems. *Journal of Computational Physics*, 325 (2016): 157-173.
15. **L. Mu**, J. Wang, and X. Ye. A Hybridized Formulation for the Weak Galerkin Mixed Finite Element Method. *Journal of Computational and Applied Mathematics*, 307(2016): 335-345.
16. Q. Zhai, R. Zhang, **L. Mu**. A New Weak Galerkin Finite Element Scheme for the Brinkman Model. *Communications in Computational Physics*, 19 (2016): 1409-1434.
17. **L. Mu**, J. Wang, and X. Ye. A Weak Galerkin Finite Element Method with Polynomial Reduction. *Journal of Computational and Applied Mathematics*, 285 (2015): 45-58.
18. **L. Mu**, J. Wang, X. Ye, and S. Zhang. A Weak Galerkin Finite Element Method for the Maxwell Equations. *Journal of Scientific Computing*, 65 (2015): 363-386.
19. F. Gao, X. Wang, **L. Mu**. A Modified Weak Galerkin Finite Element Methods for Convection-diffusion Problems in 2D. *Journal of Applied Mathematics and Computing*, 49 (2015): 493-511.

20. **L. Mu**, J. Wang, and X. Ye. Weak Galerkin Finite Element Methods on Polytopal Meshes. *International Journal of Numerical Analysis and Modeling*, 12 (2015), 31-53.
21. **L. Mu**, X. Wang, and X. Ye. A Modified Weak Galerkin Finite Element Method for the Stokes Equations. *Journal of Computational and Applied Mathematics*, 275 (2015): 79-90.
22. **L. Mu**, J. Wang, and X. Ye. A New Weak Galerkin Finite Element Method for the Helmholtz Equation. *IMA Journal of Numerical Analysis*, 35 (2015): 1228-1255.
23. G. Lin, J. Liu, **L. Mu**, and X. Ye. Weak Galerkin Finite Element Methods for Darcy Flow: Anisotropy and Heterogeneity. *Journal of Computational Physics*, 276 (2014) 422-437.
24. **L. Mu**, J. Wang, and X. Ye. A Stable Numerical Algorithm for the Brinkman Equations by Weak Galerkin Finite Element Methods. *Journal of Computational Physics*, 273 (2014): 327-342.
25. **L. Mu**, J. Wang, X. Ye, and S. Zhao. Numerical Studies on the Weak Galerkin Method for the Helmholtz Equation with Large Wave Number. *Communications in Computational Physics*, 15 (2014): 1461-1479.
26. **L. Mu**, J. Wang, Y. Wang, and X. Ye. A Weak Galerkin Mixed Finite Element Method for Biharmonic Equation. *Numerical Solution of Partial Differential Equations: Theory, Algorithms, and Their Applications*, 45 (2013): 247-277.
27. **L. Mu**, J. Wang, and X. Ye. Weak Galerkin Finite Element Methods for the Biharmonic Equation on Polytopal Meshes. *Numerical Methods for Partial Differential Equations*, 30 (2014): 1003-1029.
28. **L. Mu**, J. Wang, X. Ye, and S. Zhang. A Co-Weak Galerkin Finite Element Methods for the Biharmonic Equation. *Journal of Scientific Computing*, 59 (2014): 473-495.
29. **L. Mu**, J. Wang, Y. Wang, and X. Ye. Interior Penalty Discontinuous Galerkin Method on Very General Polygonal and Polyhedral Meshes. *Journal of Computational and Applied Mathematics*, 255 (2014): 432-440.
30. **L. Mu**, J. Wang, G. Wei, X. Ye, and S. Zhao. Weak Galerkin Methods for Second Order Elliptic Interface Problems. *Journal of Computational Physics*, 250 (2013): 106-125.
31. F. Gao, **L. Mu**. On L2 Error Estimate for Weak Galerkin Finite Element Methods for Parabolic Problems. *Journal of Computational Mathematics*, 32 (2014): 195-204.
32. **L. Mu**, J. Wang, Y. Wang, and X. Ye. A Computational Study of the Weak Galerkin Method for Second-order Elliptic Equations. *Numerical Algorithms*, 63 (2013): 753-777.

DG and Finite Volume Methods

33. **L. Mu**, X. Wang, and Y. Wang. Shape Regularity Conditions for Polygonal/polyhedral Meshes, Exemplified in a Discontinuous Galerkin Discretization. *Numerical Methods for Partial Differential Equations*, 31 (2015): 308-325.
34. **L. Mu** and R. Jari. A Posteriori Error Analysis for Discontinuous Finite Volume Methods of Elliptic Interface Problems. *Journal of Computational and Applied Mathematics*, 255 (2014): 529-543.
35. **L. Mu** and R. Jari. A Recovery-based Error Estimate for Nonconforming Finite Volume Methods of Interface Problems. *Applied Mathematics and Computation*, 220 (2013): 63-74.
36. T. Zhang, **L. Mu**, J. Yuan. A Posteriori Error Estimates of Stabilized Finite Volume Method for the Stokes Equations. *Mathematical Methods in the Applied Sciences*, 39 (2016): 32-43

37. J. Liu, **L. Mu**, X. Ye. L^2 Error Estimation for DGFEM for Elliptic Problems with Low Regularity. *Applied Mathematics Letters*, 25 (2012): 1614-1618.
38. J. Liu, **L. Mu**, X. Ye. An Adaptive Discontinuous Finite Volume Methods for Elliptic Problem. *Journal of Computational and Applied Mathematics*, 235 (2011): 5422-5431.
39. J. Liu, **L. Mu**, X. Ye, and R. Jari. Convergence of the Discontinuous Finite volume Method for Elliptic Problems with minimal Regularity. *Journal of Computational and Applied Mathematics*, 236 (2012):4537-4546.
40. **L. Mu**, R. Jari, and L. Conner. A Recovery-Based Error Estimator for Finite Volume Methods of Interface Problems: Conforming Linear Element. *Numerical Methods for Partial Differential Equations*, 29 (2013): 131-143.
41. **L. Mu** and X. Ye. A Finite Volume Method for Solving Navier-Stokes Problems. *Nonlinear Analysis: Theory, Methods & Applications*, 74 (2011): 6686-6695.
42. J. Liu, **L. Mu**, X. Ye. A Comparative Study of Locally Conservative Numerical Methods for Darcy Flows. *Procedia Computer Science*, 4 (2011): 974-983.

Postprocessing and Superconvergence

43. R. Jari, **L. Mu**. Superconvergence of $H(\text{div})$ Finite Element Approximations for the Stokes Problem by Local L^2 -projection Methods. *Journal of Computational and Applied Mathematics*, 278 (2015): 278-292.
44. R. Jari, **L. Mu**, and X. Ye. Superconvergence of $H(\text{div})$ Finite Element Approximations for the Stokes Problem by L^2 -Projection Methods. *Applied Mathematics and Computation*, 29 (2013): 5649-5656.
45. R. Jari, **L. Mu**, A. Harris, and L. Fox. Superconvergence for Discontinuous Galerkin Finite Element Methods by L^2 -projection Methods. *Computers and Mathematics with Applications*, 65 (2013): 665-672.

Computational Biomolecular System

46. Zixuan Cang, **Lin Mu**, and Guo-Wei Wei. Representability of Algebraic Topology for Biomolecules in Machine Learning Based Scoring and Virtual Screening. *PLOS Computational Biology*, 14 (1): e1005929.
47. K. Xia, Z. Li and **L. Mu**. Multiscale Persistent Functions for Biomolecular Structure Characterization. *Bulletin of Mathematical Biology*, 80 (2018): 1-31.
48. **L. Mu**, K. Xia, and G. Wei. Geometric and Electrostatic Modeling Using Molecular Rigidity Functions. *Journal of Computational and Applied Mathematics*, 313 (2017): 18-37.
49. Z. Cang, **L. Mu**, K. Wu, K. Opron, K. Xia, G. Wei. A Topological Approach for Protein Classification. *Molecular Based Mathematical Biology*, 3 (2015): 140-162.

Imaging Problems

50. N. Amraji, **L. Mu**, M. Milanova. Shape-based Human Actions Recognition in Videos. *HCI 2011, LNCS 6761*, 539-546.

Submitted Manuscripts

1. **L. Mu**. Weak Galerkin Based A Posteriori Error Estimates for Second Order Elliptic Interface Problems on Polygonal Meshes. Submitted.
2. **L. Mu**. A Priori and A Posteriori Error Estimates for Elliptic Interface Problems for A New Weak Galerkin Finite Element Methods. Submitted.
3. **Lin Mu**, Guannan Zhang. A Domain-decomposition-based Sparse Approximation for Convection-diffusion Equations with Random Coefficients. Submitted.
4. **L. Mu**, X. Zhang. An Immersed Weak Galerkin Method For Elliptic Interface Problems. Submitted.
5. **L. Mu**, F. Bao, and J. Wang. A Posteriori Error Estimates for Weak Galerkin Methods for Stokes Equations on Polygonal Meshes. Submitted.
6. X. Hu, **L. Mu**, X. Ye. A Weak Galerkin Finite Element Method for the Navier-Stokes Equations. Submitted.
7. Hengguang Li, **Lin Mu**, Xiu Ye. A Posteriori Error Estimator for Weak Galerkin Finite Element Method on Polytopal Mesh. Submitted.
8. **L. Mu**, X. Ye, and S. Zhang. Development of A P_2 Element with Optimal L^2 Convergence for Biharmonic Equation. Submitted.
9. James Adler, Xiaozhe Hu, **Lin Mu**, Xiu Ye. An a Posteriori Error Estimator for the Weak Galerkin Least-Squares Finite-Element Method. Submitted.

Invited Talk and Conference

- Applied Math Seminar, University of Alabama, 10/27, 2017.
- Novel Numerical Methods for Multiphysics Problems, SIAM Central States Section, Colorado State University, 09/29-10/01, 2017.
- Michigan State University, 06/27-07/01, 2017
- Applied Math Seminar, Mississippi State University, Apr. 20, 2017.
- SIAM SEAS, Florida State University, 03/18-03/19, 2017.
- Applied Math Seminar, University of Georgia at Athens, Feb. 27, 2017.
- Grace Hopper Celebration 2016, Houston, October 19-21, 2016.
- Seminar, University of Tennessee at Chattanooga, October 14, 2016.
- 4th workshop on Sparse Grids and Applications, Miami, Florida, October 4-7, 2016.
- The 2nd Annual Meeting of SIAM Central States Section at the University of Arkansas-Little Rock, September 30-October 2, 2016.
- International Conference on Computational Mathematics and Inverse Problems, Michigan Tech., Houghton, MI. Aug. 15-19, 2016.
- 2016 SIAM Annual Meeting, Boston, USA, July 11-15, 2016.

- The 40th SIAM Southeastern Atlantic Section Conference (SIAM-SEAS), University of Georgia, Athens, GA, USA, March 12-13, 2016.
- Workshop 3: Modeling and Computation of Transmembrane Transport, Mathematical Biosciences Institute at The Ohio State University, Ohio, Nov 16-20.
- Polytopal Element Methods in Mathematics and Engineering, Georgia Tech, Atlanta, Oct 26-28.
- RG-SciDAC annual Meeting, Oak ridge, Sep 29-Oct 1.
- The 8th International Congress on Industrial and Applied Mathematics, Beijing, CHINA, August 10-14.
- Applied Math Seminar, Xi'an Jiaotong University, CHINA, May 18, 2015.
- Workshop: Advanced Numerical Methods in the Mathematical Sciences, Texas A&M University in College Station, Texas, May 4-8, 2015.
- SIAM Conference on Computational Science and Engineering, Salt Lake City, Utah, March 14, 2015.
- Mathematics School & Institute, Jinlin University, CHINA, June 5th, 2013.
- School of Mathematics and Statistics, Xi'an Jiaotong University, CHINA, May 31, 2013.
- International Conference on Mathematical Modeling and Computation, Wuhan University, CHINA, May 16-19, 2013.
- South Central Conference on Advanced Numerical Methods and Applications, University of Arkansas at Little Rock, April 5-7, 2013.
- The 4th National Conference of College of Education for Pure Sciences, University of Thi-Qar, Iraq, March 27-28, 2013.
- School of Mathematics & Computational Science, Sun Yat-yen University, CHINA, June 12, 2012.
- Department of Mathematics, Wayne State University, Nov. 28, 2012.
- Symposium on Geophysical Flows, Xi'an Jiaotong University, CHINA, July 22-24, 2012.
- Department of Mathematics, Michigan State University, Jan. 16, 2011.
- 2011 Differential Equations Weekend Conference, Mississippi State University, May 7, 2011

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