Longfei Li

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Ph.D. in Applied Mathematics, August 2014, University of Delaware.
M.S. in Applied Mathematics, May 2011, University of Delaware.
B.S. in Mathematics, June 2009, Sichuan University, China.

Professional Experiences

- **Assistant Professor**, Department of Mathematics, University of Louisiana at Lafayette, Lafayette, LA, August 2017 – present.
- **Margaret A. Darrin Postdoctoral Fellow**, Department of Mathematical Sciences, Rensselaer Polytechnic Institute, Troy, NY, September 2014 – August 2017.
  Advisor: Dr. William D. Henshaw
- **Gore Modeling and Simulation Summer Intern**, W. L. Gore & Associates, Elkton, MD, June 2014 – August 2014.
- **Long-term Visitor**, the Institute for Mathematics and its Applications (IMA), University of Minnesota, Minneapolis, MN, February 2014 – March 2014.
- **Research Assistant**, Department of Mathematical Sciences, University of Delaware, Newark, DE, September 2010 – July 2014.
  Advisor: Dr. Richard J. Braun

Publications

1. L. Li, H. Ji, and Q. Tang. Numerical methods for fourth-order PDEs on overlapping grids with application to Kirchhoff-Love plates. *J. Sci. Comput. (under review)*, 2021
2. D. T. A. Nguyen, L. Li, and H. Ji. Stable and accurate numerical methods for generalized Kirchhoff-Love plates. *J. Eng. Math.*, 130(6), 2021
3. L. Li. A split-step finite-element method for incompressible Navier-Stokes equations with high-order accuracy up-to the boundary. *J. Comput. Phys.*, 408:109274, 2020
4. H. Ji and L. Li. Numerical methods for thermally stressed shallow shell equations. *J. Comput. Appl. Math.*, 362:626–652, 2019
5. L. Li, R. J. Braun, W. D. Henshaw, and P. E. King-Smith. Computed flow and fluorescence over the ocular surface. *Math. Med. Biol.*, 35(Supplement_1):i51–i85, 2017
6. L. Li, W. D. Henshaw, J. W. Banks, D. W. Schwendeman, and G. A. Main. A stable partitioned FSI algorithm for incompressible flow and deforming beams. *J. Comput. Phys.*, 312:272–306, 2016
7. L. Li, R. J. Braun, T. A. Driscoll, W. D. Henshaw, J. W. Banks, and P. E. King-Smith. Computed tear film and osmolarity dynamics on an eye-shaped domain. *Math. Med. Biol.*, 33:123–157, 2016
8. R. J. Braun, P. E. King-Smith, C. G. Begley, L. Li, and N. Gewecke. Dynamics and function of the tear film in relation to the blink cycle. *Prog. Ret. Eye Res.*, 45:132–164, 2015

9. L. Li, R. J. Braun, K. L. Maki, W. D. Henshaw, and P. E. King-Smith. Tear film dynamics with evaporation, wetting, and time-dependent flux boundary condition on an eye-shaped domain. *Phys. Fluids*, 26(5):052101, 2014
10. L. Li and R. J. Braun. A model for the human tear film with heating from within the eye. *Phys. Fluids*, 24:062103, 2012
11. L. Li. *Mathematical models and numerical methods for human tear film dynamics*. PhD thesis, University of Delaware, 2014

Grants

- Sole-PI: CDS&E: High-performance Computational Framework for Large-Scale FSI Applications, *National Science Foundation (NSF)*, 07/01/2022–06/30/2025 (pending).
- PI: Collaborative Research: Physics-based and Data-driven Framework for Human Tear Films, *National Science Foundation (NSF)*, 07/01/2022–06/30/2025 (pending).
- Sole PI: High-order computational methods for beams and plates with applications to fluid-structure interaction problems, *Louisiana Board of Regents Office of Sponsored Programs RCS Fund*, LEQSF(2018-21)-RD-A-23, 06/01/2018–06/30/2022 ($178,131).
- Sole PI: Numerical methods for some fluid-structure interaction problems, *Simons Foundation Mathematics and Physical Sciences-Collaboration Grants for Mathematicians*, 09/01/2018–08/31/2023 ($42,000, terminated due to receipt of another external grant) .
- Sole PI: FSI algorithm for flow and deforming beams, *Louisiana Optical Network Infrastructure (LONI) High Performance Computing*, 08/01/2017–07/01/2018 (50,000 CPU hours).

Supervision and Mentoring

Ph.D. Students

- William Benezech, Spring 2021 – present.

MS. Students

- Ms. Duong Nguyen, Fall 2018 – Fall 2020; won best poster award at a SIAM meeting; went on to Engineering School at ASU for PhD.

Software

- I am a member of the development team of the Overture object-oriented parallel framework for solving PDEs in complex moving geometry. The software is freely available from *www.OvertureFramework.org*.

Publicity

- "Working to cure ‘dry eye’ disease." May 2014, *phys.org*, *AIP Publishing* and *ScienceDaily.com*.
- "Theory meets experiment in the blink of an eye: an ocular puzzle is resolved in a new numerical simulation of human tears." Stephen G. Benka, July 2012, *Physics Today*.
- "Mathematicians model heat flow in human tears." June 2012, *phys.org*.

Honors & Awards

- FACM ’15 Travel Award, New Jersey Institute of Technology (NJIT), June 2015.
- Unidel Fellowship, University of Delaware, Spring 2014.

- American Physical Society DFD 66th Annual Meeting Travel Grant, Pittsburgh, PA, November 2013.
- FACM '13 Travel Award, New Jersey Institute of Technology (NJIT), June 2013.
- Winter Research Symposium Honorable Mention, University of Delaware, February 2013.
- Editor Selected Research Highlight of the Journal "*Physics of Fluids*," June 2012.
- Mathematics-in-Eyes Study Group Travel Award, Oxford University, Oxford, UK, July 2011.
- Groups Exploring the Mathematical Sciences (GEMS) Fellow, University of Delaware, Summer 2010.
- Excellent Graduate (comparable to the Dean's List), Sichuan University, China, June 2009.

Teaching Experience

University of Louisiana, Lafayette, LA

- Fall 2021, MATH 487 (U/G): Computational Mathematics
- Fall 2021, MATH 250 (U): Survey of Calculus
- Summer 2021, MATH 270 (U): Calculus I
- Spring 2021, MATH 556 (G): Numerical Analysis II
- Fall 2020, MATH 555 (G): Numerical Analysis I
- Fall 2020, MATH 487 (U/G): Computational Mathematics
- Spring 2020, MATH 455 (U/G): Numerical Methods
- Fall 2019, MATH 597 (G): Special Topics I
- Fall 2019, MATH 487 (U/G): Computational Mathematics
- Fall 2019, MATH 270 (U): Calculus I
- Spring 2019, MATH 656 (G): Advance Topics in Numerical Analysis II
- Fall 2018, MATH 655 (G): Advance Topics in Numerical Analysis I
- Fall 2018, MATH 250 (U): Survey of Calculus
- Spring 2018, MATH 556 (G): Numerical Analysis II
- Fall 2017, MATH 555 (G): Numerical Analysis I
- Fall 2017, MATH 250 (U): Survey of Calculus

Rensselaer Polytechnic Institute, Troy, NY

- September 2014 – August 2017, participated in mentoring the graduate students of our research group

University of Delaware, Newark, DE

- Winter 2014, MATH 243 (U): Analytic Geometry & Calculus C
- Winter 2013, MATH 243 (U): Analytic Geometry & Calculus C
- Spring 2010, MATH 241 (U): Analytic Geometry & Calculus A (TA)
- Fall 2009, MATH 243 (U): Analytic Geometry & Calculus C (Grader)
- Fall 2009, MATH 242 (U): Analytic Geometry & Calculus B (Grader)

Invited Seminars

1. "Numerical methods for fourth-order PDEs on overlapping grids with application to Kirchhoff-Love plates," Numerical Analysis Seminar, Department of Mathematics, North Carolina State University, Virtual, September, 2021.
2. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," PETE Seminar, Department of Petroleum Engineering, University of Louisiana, Lafayette, LA, November 2019.
3. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Department of Mathematics and Tianyuan Mathematical Center in Northeast China, Jilin University, Changchun, China, June 2019.
4. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Clements Scientific Computing Seminar, Southern Methodist University, Dallas, TX, April, 2019.
5. "An efficient finite-element algorithm for incompressible Navier-Stokes equations with high-order accuracy up to the boundary," Computational and Applied Mathematics (CAM) seminar, Mississippi State University, MS, February, 2019.
6. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," School of Information Science and Technology Colloquium, ShanghaiTech University, Shanghai, China, December, 2018.
7. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Department of Mathematics Colloquium, Southern University of Science and Technology, Shenzhen, China, December, 2018.
8. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," School of Science Colloquium, Harbin Institute of Technology, Shenzhen, China, December, 2018.
9. "An efficient finite-element algorithm for incompressible Navier-Stokes equations with high-order accuracy up-to the boundary," College of Mathematics Colloquium, Sichuan University, Chengdu, China, December, 2018.
10. "An efficient finite-element algorithm for incompressible Navier-Stokes equations with high-order accuracy up-to the boundary," School of Mathematical Sciences Colloquium, University of Electronic Science and Technology of China, Chengdu, China, December, 2018.
11. "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," Computational Mathematics Seminar Series, Louisiana State University, Baton Rouge, LA, April, 2018.
12. "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," Applied Mathematics Seminar, University of Louisiana at Lafayette, Lafayette, LA, February, 2018.
13. "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," College of Mathematics, Sichuan University, Chengdu, China, December, 2017.
14. "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," School of Mathematical Sciences, University of Electronic Science and Technology of China, Chengdu, China, December, 2017.
15. "Computed flow and fluorescence over the ocular surface," Department of Mathematics Colloquium, University of Louisiana at Lafayette, Lafayette, LA, September, 2017.

16. "Asymptotically Well-posed Boundary Conditions for Partitioned Fluid-Structure Algorithms," Computational Science Seminar, University of Massachusetts Dartmouth, Dartmouth, MA, May, 2017.
17. "Asymptotically Well-posed Boundary Conditions for Partitioned Fluid-Structure Algorithms," Department of Mathematics Colloquium, University of Louisiana at Lafayette, Lafayette, LA, March, 2017.
18. "Asymptotically Well-posed Boundary Conditions for Partitioned Fluid-Structure Algorithms," Theoretical Division T-5: Applied Mathematics and Plasma Physics, Los Alamos National Laboratory (LANL), Los Alamos, NM, March, 2017.
19. "High-Performance Computational Methods for Multi-physics problems in Complex Domains," Department of Mathematics and Statistics Colloquium, University at Albany, State University of New York Albany, NY, March, 2017.
20. "Added-mass partitioned (AMP) algorithm for the deforming beam and fluid interaction," Center for Applied and Computational Mathematics Seminar, Rochester Institute of Technology, Rochester, NY, September 2016.
21. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Applied and Computational Mathematics Seminar, George Mason University, Fairfax, VA, March 2016.
22. "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Applied Mathematics Seminar, University of Delaware, Newark, DE, February 2016.
23. "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," Computational Science and Engineering seminar at Scientific Computation Research Center (SCOREC), Rensselaer Polytechnic Institute, Troy, NY, September 2015.
24. "Mathematical models and numerical methods for human tear film dynamics," Center for Applied and Computational Mathematics Seminar, Rochester Institute of Technology, Rochester, NY, September 2014.
25. "A model coupling tear film and osmolarity dynamics on the eye," Applied Mathematics Seminar, University of Delaware, Newark, DE, March 2014.
26. "A model coupling tear film and osmolarity dynamics on the eye," Mathematical Biology Seminar, University of Minnesota, Minneapolis, MN, February 2014.

Conference and Workshop Presentations

Presentations

1. Scientific Computing Around Louisiana (SCALA), "Stable and Accurate Numerical Methods for a Generalized Kirchhoff-Love Plate Model," Baton Rouge, LA, February, 2020.
2. Minisymposium talk at the SIAM Texas-Louisiana Sectional Meeting, "Recent Advance on Extending the Added-Mass Partitioned (AMP) Scheme for Solving FSI Problems Coupling Incompressible Flows with Elastic Beams to the 3D Regime," Dallas, TX, November, 2019.
3. Contributed talk at SIAM Conference on Computational Science and Engineering (CSE), "Numerical Methods for Thermally Stressed Shallow Shell Equations," Spokane, WA, March, 2019.
4. Minisymposium talk at SIAM Conference on Computational Science and Engineering (CSE), "Extending the Added-mass Partitioned (AMP) Scheme for Solving FSI Problems Coupling Incompressible Flows with Elastic Beams to 3D," Spokane, WA, February, 2019.

5. Scientific Computing Around Louisiana (SCALA), "An Efficient Finite-Element Algorithm for Incompressible Navier-Stokes Equations with High-Order Accuracy up-to the Boundary," New Orleans, LA, February, 2019.
6. 14th Symposium on Overset Composite Grids and Solution Technology, "Recent Advance on Extending the Added-Mass Partitioned (AMP) Scheme for Solving FSI Problems Coupling Incompressible Flows with Elastic Beams to the 3D Regime," University of Maryland, College Park, MD, October, 2018.
7. Scientific Computing Around Louisiana (SCALA), "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," Baton Rouge, LA, February, 2018.
8. Minisymposium talk at the 3rd Annual Meeting of SIAM Central States Section, "A Split-Step Finite-Element Method for Incompressible Navier-Stokes Equations with High-Order Accuracy up-to the Boundary," Fort Collins, CO, September, 2017.
9. Minisymposium talk at SIAM Conference on Computational Science and Engineering (CSE), "A Split-Step Finite-Element Method for Incompressible Navier-Stokes Equations with High-Order Accuracy up-to the Boundary," Atlanta, GA, February, 2017.
10. Minisymposium talk at SIAM Conference on Computational Science and Engineering (CSE), "Added-Mass Partitioned (AMP) Algorithm for the Deforming Beam and Fluid Interaction," Atlanta, GA, February, 2017.
11. 13th Symposium on Overset Composite Grids and Solution Technology, "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Future of Flight Aviation Center, Mukilteo, WA, October, 2016.
12. Minisymposium talk at SIAM Annual Meeting, "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Boston MA, July 2016.
13. Applied Math Days, "A stable partitioned FSI algorithm for incompressible flow and deforming beams," Troy NY, April 2016.
14. Frontiers in Applied and Computational Mathematics (FACM '15), "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," New Jersey Institute of Technology, Newark, NJ, June 2015.
15. Minisymposium talk at SIAM Conference on Computational Science and Engineering (CSE), "Overcoming the added-mass instability for coupling incompressible flows and elastic beams," Salt Lake City, UT, March 2015.
16. The 66th Annual Meeting of the APS Division of Fluid Dynamics, "Coupling osmolarity dynamics within human tear film on an eye-shaped Domain," Pittsburgh, PA, November 2013.
17. Frontiers in Applied and Computational Mathematics (FACM '13), "Modeling tear film dynamics with time dependent flux boundary conditions on a 2D eye-shaped domain," New Jersey Institute of Technology, Newark, NJ, June 2013.
18. The 65th Annual Meeting of the APS Division of Fluid Dynamics, "Modeling tear film dynamics on a 2-D eye-shaped domain," San Diego, CA, November 2012.
19. Mid Atlantic Numerical Analysis Day, "Tear film dynamics on an eye-shaped domain," Temple University, Philadelphia, PA, November 2012.
20. Hallenbeck Graduate Student Seminar, "Modeling tear film on a 2D eye-shaped domain," University of Delaware, Newark, DE, September 2012.

21. Minisymposium talk at SIAM Annual Meeting, "Tear film dynamics on an eye-shaped domain," Minneapolis, MN, July 2012.
22. The 64th Annual Meeting of the APS Division of Fluid Dynamics, "Tear film dynamics and cooling of the anterior eye," Baltimore, MD, November 2011.
23. Minisymposium talk at the 7th International Congress on Industrial and Applied Mathematics (ICIAM), "Tear film dynamics and cooling of the anterior eye," Vancouver, Canada, July 2011
24. SIAM Mid-Atlantic Regional Applied Mathematics Student Conference, "A model for the human tear film with heating from within the eye," Shippensburg, PA, April 2011.

Posters

1. SIAM Conference on Computational Science and Engineering (CSE15), "Computed tear film and solute dynamics on an eye-shaped domain," Salt Lake City, UT, March 2015.
2. The 7th International Conference on the Tear Film & Ocular Surface, "Computed tear film and osmolarity dynamics on an eye-shaped domain," Taormina, Italy, September 2013.
3. University of Delaware Winter Research Symposium, "Tear film dynamics on an eye-shaped domain," February, 2013.
4. University of Delaware Winter Research Symposium, "A model for the human tear film with heating from within the eye," February, 2012.

Workshops

1. "Celebrating 75 Years of Mathematics of Computation," topical workshop at the Institute for Computational and Experimental Research in Mathematics (ICERM), Brown University, Providence, RI, November 2018.
2. "Advances in PDEs: Theory, Computation and Application to CFD," topical workshop at the Institute for Computational and Experimental Research in Mathematics (ICERM), Brown University, Providence, RI, August 2018.
3. "Frozen shapes: thin nearly flat elastic shells with stretching and bendings (Corning Inc.)," Mathematical Problems in Industry, University of Delaware, Newark, DE, June 2015.
4. "Structure-performance relations in fibrous materials (W. L. Gore & Associates)," Mathematical Problems in Industry, New Jersey Institute of Technology, Newark, NJ, June 2014.
5. IMA Annual Program Year Workshop: Topological Structures in Computational Biology, University of Minnesota, December 2013.
6. "Fuel cell assembly process flow for high productivity (Bloom Energy)," Mathematical Problems in Industry, University of Delaware, Newark, DE, June 2012.
7. "Modeling sterling engine," Graduate Student Mathematical Modeling Camp, Rensselaer Polytechnic Institute, Troy, NY, June 2012.
8. "Glaucoma, fluid flow and the starling resistor," Mathematics-in-Eyes Study Group, Oxford University, Oxford, UK, July 2011.

Professional Service

Conference, minisymposium and workshop (co-)organized

- Minisymposium on *High-order accurate numerical methods for fluid-structure interaction problems* at the SIAM Conference on Computational Science and Engineering (CSE19), Spokane, Washington, February, 2019.

- Minisymposium on *High-order accurate numerical methods for multi-physics problems* at the SIAM Texas-Louisiana Sectional Meeting, Louisiana State University, Baton Rouge, LA, October, 2018.
- Minisymposium on *Advances in Computational Methods for Multiphysics Problems* at the SIAM Conference on Computational Science and Engineering (CSE17), Atlanta, GA, February, 2017.
- Minisymposium on *Advances in Computational Methods for Fluid-Structure Interaction Problems* at the 2016 SIAM Annual Meeting, Boston, MA, July, 2016.

Referee for

- SIAM Journal on Applied Mathematics; Journal of Fluid Mechanics; Physics of Fluids; Journal of Fluids and Structures; Applied Mathematical Modeling; Mathematical Methods in the Applied Sciences; Journal of Computational Science; Journal of Engineering Mathematics; Journal of Materials Science and Nanotechnology; International Journal for Numerical Methods in Engineering.

Computer Skills

- C/C++, Python, Perl, MPI, Fortran, Matlab, LaTeX, Overture, FreeFEM++, tensorflow and shell scripting.