Lu Lu

Assistant Professor
Department of Chemical and Biomolecular Engineering, University of Pennsylvania
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Education

Brown University 8/2014–5/2020

- **Ph.D.** in Applied Mathematics
- **M.Sc.** in Computer Science
- **M.Sc.** in Applied Mathematics
- **M.Sc.** in Engineering
- Advisor: George Em Karniadakis

Tsinghua University, Beijing, China 8/2009–7/2013

- **B.Eng.** in Energy, Power System and Automation
- **B.Ec.** in Economics
- **Minor** in Computer Technology and Application

Appointments

University of Pennsylvania 9/2021–present

- Assistant Professor, Department of Chemical and Biomolecular Engineering
- Faculty, Graduate Group in Applied Mathematics and Computational Science
- Faculty, Penn Institute for Computational Science
- Faculty, Vagelos Institute for Energy Science and Technology
- Faculty, The Laboratory for Research on the Structure of Matter
- Faculty, Penn Cardiovascular Institute
- Faculty, CHOP Cardiovascular Institute

Massachusetts Institute of Technology 9/2020–5/2021

- Applied Mathematics Instructor, Department of Mathematics

Publications

- Google Scholar
- †Corresponding author
- *These authors contributed equally to this work.

Preprints

1. M. Zhu, H. Zhang, A. Jiao, G. E. Karniadakis, & **L. Lu**†. Reliable extrapolation of deep neural operators informed by physics or sparse observations. *arXiv preprint arXiv:2212.06347*, 2022.
2. W. Wu, M. Daneker, M. A. Jolley, K. T. Turner, & **L. Lu**†. Effective data sampling strategies and boundary condition constraints of physics-informed neural networks for identifying material properties in solid mechanics. *arXiv preprint arXiv:2211.15423*, 2022.

3. X. Liu, H. Sun, M. Zhu, **L. Lu**, & J. Wang. Predicting parametric spatiotemporal dynamics by multi-resolution PDE structure-preserved deep learning. *arXiv preprint arXiv:2205.03990*, 2022.
4. M. Daneker, Z. Zhang, G. E. Karniadakis, & **L. Lu**[†]. Systems biology: Identifiability analysis and parameter identification via systems-biology informed neural networks. *arXiv preprint arXiv:2202.01723*, 2022.
5. A. Jiao, H. He, R. Ranade, J. Pathak, & **L. Lu**[†]. One-shot learning for solution operators of partial differential equations. *arXiv preprint arXiv:2104.05512*, 2021.

Journal Papers

1. P. Clark Di Leoni, **L. Lu**, C. Meneveau, G. E. Karniadakis, & T. A. Zaki. Neural operator prediction of linear instability waves in high-speed boundary layers. *Journal of Computational Physics*, 474, 111793, 2023.
2. C. Wu, M. Zhu, Q. Tan, Y. Kartha, & **L. Lu**[†]. A comprehensive study of non-adaptive and residual-based adaptive sampling for physics-informed neural networks. *Computer Methods in Applied Mechanics and Engineering*, 403, 115671, 2023.
3. P. Jin, S. Meng, & **L. Lu**[†]. MIONet: Learning multiple-input operators via tensor product. *SIAM Journal on Scientific Computing*, 44(6), A3490–A3514, 2022.
4. B. Deng, Y. Shin, **L. Lu**, Z. Zhang, & G. E. Karniadakis. Approximation rates of DeepONets for learning operators arising from advection-diffusion equations. *Neural Networks*, 153, 411–426, 2022.
5. **L. Lu**[†], R. Pestourie, S. G. Johnson, & G. Romano. Multifidelity deep neural operators for efficient learning of partial differential equations with application to fast inverse design of nanoscale heat transport. *Physical Review Research*, 4(2), 023210, 2022.
6. J. Yu, **L. Lu**[†], X. Meng, & G. E. Karniadakis. Gradient-enhanced physics-informed neural networks for forward and inverse PDE problems. *Computer Methods in Applied Mechanics and Engineering*, 393, 114823, 2022.
7. **L. Lu**, X. Meng, S. Cai, Z. Mao, S. Goswami, Z. Zhang, & G. E. Karniadakis. A comprehensive and fair comparison of two neural operators (with practical extensions) based on FAIR data. *Computer Methods in Applied Mechanics and Engineering*, 393, 114778, 2022.
8. **L. Lu**[†], R. Pestourie, W. Yao, Z. Wang, F. Verdugo, & S. G. Johnson. Physics-informed neural networks with hard constraints for inverse design. *SIAM Journal on Scientific Computing*, 43(6), B1105–B1132, 2021.
9. H. Li, Z. L. Liu, **L. Lu**, P. Buffet, & G. E. Karniadakis. How the spleen reshapes and retains young and old red blood cells: A computational investigation. *PLoS Computational Biology*, 17(11), e1009516, 2021.
10. Z. Mao, **L. Lu**, O. Marxen, T. A. Zaki, & G. E. Karniadakis. DeepM&Mnet for hypersonics: Predicting the coupled flow and finite-rate chemistry behind a normal shock using neural-network approximation of operators. *Journal of Computational Physics*, 447, 110698, 2021.
11. Y. Deng[*], **L. Lu**[*], L. Aponte, A. M. Angelidi, V. Novak, G. E. Karniadakis, & C. S. Mantzoros. Deep transfer learning and data augmentation improve glucose levels prediction in type 2 diabetes patients. *npj Digital Medicine*, 4, 109, 2021.
12. G. E. Karniadakis[*], I. G. Kevrekidis[*], **L. Lu**[*], P. Perdikaris[*], S. Wang[*], & L. Yang[*]. Physics-informed machine learning. *Nature Reviews Physics*, 3(6), 422–440, 2021.
13. S. Cai, Z. Wang, **L. Lu**, T. A. Zaki, & G. E. Karniadakis. DeepM&Mnet: Inferring the electroconvection multiphysics fields based on operator approximation by neural networks. *Journal of Computational Physics*, 436, 110296, 2021.
14. **L. Lu**, P. Jin, G. Pang, Z. Zhang, & G. E. Karniadakis. Learning nonlinear operators via DeepONet

based on the universal approximation theorem of operators. *Nature Machine Intelligence*, 3, 218–229, 2021.
  - Highlighted on *Nature Machine Intelligence*, 3, 192–193, 2021, Tech Xplore, Quanta Magazine
15. C. Lin, Z. Li, **L. Lu**, S. Cai, M. Maxey, & G. E. Karniadakis. Operator learning for predicting multiscale bubble growth dynamics. *The Journal of Chemical Physics*, 154(10), 104118, 2021.
16. **L. Lu**, X. Meng, Z. Mao, & G. E. Karniadakis. DeepXDE: A deep learning library for solving differential equations. *SIAM Review*, 63(1), 208–228, 2021.
17. A. Yazdani*, **L. Lu***, M. Raissi, & G. E. Karniadakis. Systems biology informed deep learning for inferring parameters and hidden dynamics. *PLoS Computational Biology*, 16(11), e1007575, 2020.
    - Highlighted on *Nature Computational Science*, 1, 16, 2021
18. **L. Lu***, Y. Shin*, Y. Su, & G. E. Karniadakis. Dying ReLU and initialization: Theory and numerical examples. *Communications in Computational Physics*, 28(5), 1671–1706, 2020.
19. P. Jin*, **L. Lu***, Y. Tang, & G. E. Karniadakis. Quantifying the generalization error in deep learning in terms of data distribution and neural network smoothness. *Neural Networks*, 130, 85–99, 2020.
20. Y. Chen, **L. Lu**, G. E. Karniadakis, & L. D. Negro. Physics-informed neural networks for inverse problems in nano-optics and metamaterials. *Optics Express*, 28(8), 11618–11633, 2020.
    - Top-downloaded articles on deep learning in *Optics Express*, 2020
21. **L. Lu***, M. Dao*, P. Kumar, U. Ramamurty, G. E. Karniadakis, & S. Suresh. Extraction of mechanical properties of materials through deep learning from instrumented indentation. *Proceedings of the National Academy of Sciences*, 117(13), 7052–7062, 2020.
    - MIT News, Brown News, NTU News
22. G. Pang*, **L. Lu***, & G. E. Karniadakis. fPINNs: Fractional physics-informed neural networks. *SIAM Journal on Scientific Computing*, 41(4), A2603–A2626, 2019.
23. **L. Lu***, Z. Li*, H. Li*, X. Li, P. G. Vekilov, & G. E. Karniadakis. Quantitative prediction of erythrocyte sickling for the development of advanced sickle cell therapies. *Science Advances*, 5(8), eaax3905, 2019.
    - Highlighted on *Science Advances* homepage, SIAM News, eHealthNews.eu, Brown News, Brown Daily Herald
24. D. Zhang, **L. Lu**, L. Guo, & G. E. Karniadakis. Quantifying total uncertainty in physics-informed neural networks for solving forward and inverse stochastic problems. *Journal of Computational Physics*, 397, 108850, 2019.
25. H. Li*, **L. Lu***, X. Li, P. A. Buffet, M. Dao, G. E. Karniadakis, & S. Suresh. Mechanics of diseased red blood cells in human spleen and consequences for hereditary blood disorders. *Proceedings of the National Academy of Sciences*, 115(38), 9574–9579, 2018.
26. H. Li, D. Papageorgiou, H. Y. Chang, **L. Lu**, J. Yang, & Y. Deng. Synergistic integration of laboratory and numerical approaches in studies of the biomechanics of diseased red blood cells. *Biosensors*, 8(3), 76, 2018.
27. **L. Lu***, Y. Deng*, X. Li, H. Li, & G. E. Karniadakis. Understanding the twisted structure of amyloid fibrils via molecular simulations. *The Journal of Physical Chemistry B*, 122(49), 11302–11310, 2018.
28. H. Li, J. Yang, T. T. Chu, R. Naidu, **L. Lu**, R. Chandramohanadas, M. Dao & G. E. Karniadakis. Cytoskeleton remodeling induces membrane stiffness and stability changes of maturing reticulocytes. *Biophysical Journal*, 114(8), 2014–2023, 2018.
    - Highlighted on *Biophysical Journal* homepage
29. H. Li, H. Y. Chang, J. Yang, **L. Lu**, Y. H. Tang, & G. Lykotrafitis. Modeling biomembranes and red blood cells by coarse-grained particle methods. *Applied Mathematics and Mechanics*, 39(1), 3–20, 2018.

30. **L. Lu**, H. Li, X. Bian, X. Li, & G. E. Karniadakis. Mesoscopic adaptive resolution scheme toward understanding of interactions between sickle cell fibers. *Biophysical Journal*, 113(1), 48–59, 2017.
    - Cover Article, DOE Science News Source, OLCF News, Brown News, Brown Daily Herald, Brown Graduate School News
31. Y. H. Tang*, **L. Lu***, H. Li, C. Evangelinos, L. Grinberg, V. Sachdeva, & G. E. Karniadakis. OpenRBC: A fast simulator of red blood cells at protein resolution. *Biophysical Journal*, 112(10), 2030–2037, 2017.
    - Highlighted on *Biophysical Journal* homepage
32. **L. Lu**, X. Li, P. G. Vekilov, & G. E. Karniadakis. Probing the twisted structure of sickle hemoglobin fibers via particle simulations. *Biophysical Journal*, 110(9), 2085–2093, 2016.
    - Highlighted on *Biophysical Journal* homepage
33. **L. Lu**, X. Zhang, Y. Yan, J. M. Li, & X. Zhao. Theoretical analysis of natural-gas leakage in urban medium-pressure pipelines. *Journal of Environment and Human*, 1(2), 71–86, 2014.

Patents

1. G. E. Karniadakis, & **L. Lu**. Deep operator network. *U.S. Application* No. 63/145,783, *International Application* No. PCT/US2022/015340, filed on February 4, 2021.
2. **L. Lu**, M. Dao, S. Suresh, & G. E. Karniadakis. Machine learning techniques for estimating mechanical properties of materials. *U.S. Patent* No. 11,461,519, filed on June 24, 2019, and issued on June 30, 2022.
3. X. Dong, J. M. Li, Y. Yan, H. Zhang, **L. Lu**, J. Wang, & H. Xiao. A test device and method for simulating natural gas leakage in soil. *China Invention Patent* CN103712755A, filed on June 14, 2013, and issued on April 9, 2014.

Softwares

- DeepXDE
  - A library for scientific machine learning and physics-informed learning.
  - >300,000 downloads, >1,300 GitHub Stars, >40 Contributors
  - GitHub
- OpenRBC
  - A coarse-grained molecular dynamics code for simulating entire human red blood cells at the protein resolution.
  - Third Prize, IBM OpenPOWER Developer Challenge contest, 2016.
  - GitHub
- Source code of research papers
  - Lu Group's GitHub
  - Lu Lu's GitHub

Awards and Honors

Selected Awards and Honors

- U.S. Department of Energy Early Career Award, 2022.
- Chinese Government Award for Outstanding Self-financed Students Abroad, 2020.
- Joukowsky Family Foundation Outstanding Dissertation Award, Brown University, 2020.
- David Gottlieb Memorial Award, Division of Applied Mathematics, Brown University, 2020.
- Luis W. Alvarez Fellowship, Lawrence Berkeley National Laboratory, 2020. (declined)

- Lawrence Fellowship, Lawrence Livermore National Laboratory, 2020. (declined)
- Stephen Timoshenko Fellowship, Stanford University, 2020. (declined)
- Eugene P. Wigner Fellowship, Oak Ridge National Laboratory, 2020. (declined)
- J. H. Wilkinson Fellowship, Argonne National Laboratory, 2020. (declined)
- J. Robert Oppenheimer Fellowship, Los Alamos National Laboratory, 2019. (declined)
- Open Graduate Education Program, Brown University, 2017.
- Provincial Outstanding Graduates, Beijing, China, 2013.
- Provincial Merit Student, Beijing, China, 2013.
- Outstanding Graduates, Tsinghua University, 2013.
- Outstanding Undergraduate Graduation Thesis, Tsinghua University, 2013.
- December Ninth Scholarship, Tsinghua University, 2012.

Other Awards and Honors

- Early Career Travel Award, SIAM Conference on Uncertainty Quantification, 2022.
- Early Career Travel Award, SIAM Conference on Applications of Dynamical Systems, 2021.
- Early Career Travel Award, SIAM Conference on Computational Science and Engineering, 2021.
- Full Member, Sigma Xi, 2020.
- Student Travel Award, SIAM Conference on Mathematics of Data Science, 2020.
- Conference Travel Fund, Brown University, 2020.
- Travel Grant, Physics Informed Machine Learning Workshop, 2020.
- Travel Support Award, Machine Learning and the Physical Sciences workshop (NeurIPS), 2019.
- Open Graduate Education Travel Award, Brown University, 2019.
- International Conference Travel Fund, Brown University, 2019.
- Associate Member, Sigma Xi, 2018.
- George Irving Hopkins Fellowship, Brown University, 2017.
- Third Prize, IBM OpenPOWER Developer Challenge contest, 2016.
- Fellowship for graduate students, Brown University, 2015.
- Excellent Student Cadre, Tsinghua University, 2013.
- Summer Research Scholarship, Chinese Undergraduate Visiting Research Program, Stanford University, 2012.
- Outstanding Volunteer, Tsinghua University learning center, 2012.
- Member of "Spark" Innovative Talent Cultivation Program, Tsinghua University, 2011.
- Tsinghua Friend–Kai Feng Fellowship, Tsinghua University, 2011.
- Best Paper Award, 10th National Symposium on Refrigerators, Air Conditioners and Compressors, Shandong, China, 2011.
- Third Prize, 29th "Challenge Cup" Tsinghua University Students' Extracurricular Academic Science and Technology Works Contest, 2011.
- Three-star Volunteer, Tsinghua University, 2011.
- Tsinghua Friend–Kai Feng Fellowship, Tsinghua University, 2010.
- First Prize, 27th Annual National Physics Contest for College Students, Beijing, China, 2010.
- Second Prize, 4th Intelligent Car Competition, Tsinghua University, 2010.
- First Prize, Chinese Physics Olympiad, Jiangsu, China, 2008.
- First Prize, Chinese Mathematical Olympiad, Jiangsu, China, 2008.
- Third Prize, Chinese Chemistry Olympiad, Jiangsu, China, 2008.
- Second Prize, Chinese Physics Olympiad, Jiangsu, China, 2007.

Research Grants

Current Grants

1. DOE SC Early Career Research Program 7/2022–6/2027
   Role: PI $750,000
   Title: Physics-informed neural operators for fast prediction of multiscale systems
2. ExxonMobil Technology and Engineering Company 5/2022–4/2023
   Role: PI $70,000
   Title: Surrogate modeling for large-scale reservoir simulations for geological carbon sequestration

Completed Grants

1. Penn's Center for Undergraduate Research and Fellowships, Penn Undergraduate Research Mentorship award Summer 2022
   Role: PI $10,000
   Title: Physics-informed neural networks for solving differential equations

Talks and Presentations

Invited Keynote and Plenary Talks

1. Learning operators using deep neural networks for multiphysics, multiscale, & multifidelity problems. *Mathematical and Scientific Machine Learning*, Beijing, China, Aug. 2022.

Invited Seminar Talks

1. Deep neural operators for multiphysics, multiscale, & multifidelity problems. *Pennsylvania State University, Department of Mathematics, Computational and Applied Mathematics Colloquium*, Dec. 2022.
2. Deep neural operators for multiphysics, multiscale, & multifidelity problems. *Xi'an Jiaotong University, School of Mechanical Engineering*, Nov. 2022.
3. Deep neural operators for multiphysics, multiscale, & multifidelity problems. *Texas Tech University, Department of Mathematics and Statistics, Applied Mathematics Seminar*, Nov. 2022.
4. Deep neural operators for multiphysics, multiscale, & multifidelity problems. *Ansys*, Oct. 2022.
5. Deep neural operators for multiphysics, multiscale, & multifidelity problems. *Yanqi Lake Beijing Institute of Mathematical Sciences and Applications, BIMSA-Tsinghua seminar on Machine Learning and Differential Equations*, Oct. 2022.
6. Learning operators using deep neural networks for multiphysics, multiscale, & multifidelity problems. *e-Seminar on Scientific Machine Learning*, Sept. 2022.
7. Learning operators using deep neural networks for multiphysics, multiscale, & multifidelity problems. *Los Alamos National Laboratory, Center for Nonlinear Studies*, Aug. 2022.
8. Learning operators using deep neural networks for multiphysics, multiscale, & multifidelity problems. *Beijing Jiaotong University, Institute for Artificial Intelligence*, Aug. 2022.
9. Learning operators using deep neural networks for multiphysics, multiscale, & multifidelity problems. *East China Normal University, Data Science and Engineering Summer School*, July 2022.
10. Physics-informed neural networks: Algorithms, applications, and software. *East China Normal University, Data Science and Engineering Summer School*, July 2022.

11. Learning operators using deep neural networks for multiphysics, multiscale, & multifidelity problems. *Hohai University, Mechanics and Artificial Intelligence Lecture Series*, July 2022.
12. Physics-informed neural network: Algorithms, applications, and software. *Swansea University, Zienkiewicz Centre for Computational Engineering*, June 2022.
13. Learning operators using deep neural networks for diverse applications. *Vision and Learning Seminar*, June 2022.
14. Physics-informed deep learning. *Imperial College London, DataLearning Working Group Seminar*, May 2022.
15. Learning operators using deep neural networks for diverse applications. *Xinjiang University, School of Future Technology*, May 2022.
16. Multifidelity deep neural operators for efficient learning of partial differential equations with application to fast inverse design of nanoscale heat transport. *Brown University, Crunch Seminar*, May 2022.
17. Integrating machine learning & multiscale modeling in biomedicine. *University of Pennsylvania, Center for Engineering MechanoBiology*, Apr. 2022.
18. Physics-informed deep learning. *Synced & Chinese Academy of Sciences, Institute of Automation*, Apr. 2022.
19. Learning operators using deep neural networks for diverse applications. *The University of Hong Kong, Department of Mathematics, Optimization and Machine Learning Seminar*, Apr. 2022.
20. Learning operators using deep neural networks for diverse applications. *Florida State University, Department of Mathematics*, Apr. 2022.
21. Physics-informed deep learning. *Tsinghua University, Department of Automation*, Mar. 2022.
22. Learning operators using deep neural networks for diverse applications. *ExxonMobil Research and Engineering Company*, Feb. 2022.
23. Learning operators using deep neural networks for diverse applications. *Southern Methodist University, Department of Mathematics, Clements Scientific Computing Seminar Series*, Feb. 2022.
24. Deep learning and scientific computing. *Tianyuan Mathematical Center in Southeast China*, Dec. 2021.
25. Learning nonlinear operators using deep neural networks for diverse applications. *Chinese Academy of Sciences, Institute of Systems Science*, Dec. 2021.
26. Physics-informed neural network: Algorithms, applications, and software. *Chinese Academy of Sciences, Institute of Systems Science*, Dec. 2021.
27. Learning nonlinear operators using deep neural networks for diverse applications. *The University of Southern Mississippi, School of Mathematics and Natural Sciences*, Oct. 2021.
28. Learning nonlinear operators using deep neural networks for diverse applications. *Towson University, Department of Mathematics*, Oct. 2021.
29. Physics-informed neural network: Algorithms, applications, and software. *Central China Normal University, QCD School*, Oct. 2021.
30. Learning nonlinear operators using deep neural networks for diverse applications. *Southeast University, School of Mathematics*, Oct. 2021.
31. Learning nonlinear operators using deep neural networks for diverse applications. *The University of Texas at El Paso, Department of Mechanical Engineering*, Oct. 2021.
    - Minority-serving institution (MSI)
32. Physics-informed deep learning. *Synced*, Aug. 2021.
33. DeepONet: Learning nonlinear operators. *University of Iowa, Department of Mathematics*, May 2021.
34. Integrating machine learning & multiscale modeling. *Purdue University, Department of Mathematics*, Feb. 2021.

35. Integrating machine learning & multiscale modeling in biomedicine. *Queen's University, Department of Mechanical and Material Engineering*, Feb. 2021.
36. Integrating machine learning & multiscale modeling in biomedicine. *University of Pennsylvania, Department of Chemical and Biomolecular Engineering*, Feb. 2021.
37. Physics-informed deep learning. *Emory University, Scientific Computing Group*, Apr. 2020.
38. Scientific machine learning. *Lawrence Berkeley National Laboratory, Computing Sciences*, Mar. 2020.
39. Scientific machine learning. *Lawrence Livermore National Laboratory*, Feb. 2020.
40. Scientific machine learning. *Worcester Polytechnic Institute, Mathematical Sciences Department*, Feb. 2020.
41. Scientific machine learning. *Oak Ridge National Laboratory*, Jan. 2020.
42. Scientific machine learning. *Argonne National Laboratory, Mathematics and Computer Science Division*, Jan. 2020.
43. Scientific machine learning. *University of Pittsburgh, Department of Mechanical Engineering and Materials Science*, Nov. 2019.
44. Scientific machine learning. *University of North Carolina at Charlotte, Department of Mathematics and Statistics*, Nov. 2019.

Invited Conference Talks

1. Deep neural operators for multiphysics, multiscale, & multifidelity problems. *AAAI Fall Symposium on Knowledge-guided Machine Learning*, Arlington, VA, Nov. 2022.
2. Physics-informed neural networks: Algorithms, applications, and software. *Applied Analysis Day*, Ottawa, Canada, Nov. 2022.
3. Deep neural operators for multiphysics, multiscale, & multifidelity problems. *Symposium on Intelligent Simulation and Control for Multiscale Mechanics*, Beijing, China, Oct. 2022.
4. Physics-informed neural networks with hard constraints for inverse design. *SIAM Conference on Mathematics of Data Science*, San Diego, CA, Sept. 2022.
5. Physics-informed deep learning. *Wave Summit*, Beijing, China, May 2022.
6. DeepONet: Learning nonlinear operators. *Conference on the Numerical Solution of Differential and Differential-Algebraic Equations*, Martin Luther University Halle-Wittenberg, Germany, Sept. 2021.
7. DeepONet: Learning nonlinear operators. *SIAM Conference on Applications of Dynamical Systems*, Virtually, May 2021.
8. DeepONet: Learning nonlinear operators based on the universal approximation theorem of operators. *SIAM Conference on Computational Science and Engineering*, Virtually, Mar. 2021.
9. DeepONet: Learning nonlinear operators based on the universal approximation theorem of operators. *SIAM Conference on Mathematics of Data Science*, Virtually, June 2020.
10. DeepXDE: A deep learning library for solving differential equations. *SIAM Conference on Mathematics of Data Science*, Virtually, June 2020.
11. DeepONet: Learning nonlinear operators for identifying differential equations based on the universal approximation theorem of operators. *Joint Mathematics Meetings*, Denver, CO, Jan. 2020.
12. Collapse of deep and narrow neural nets. *ICERM Scientific Machine Learning*, Providence, RI, Jan. 2019.
13. OpenRBC: A fast simulator of red blood cells at protein resolution. *SIAM Annual Meeting*, Pittsburgh, PA, July 2017.

Contributed Conference Presentations

1. One-shot learning for solution operators of partial differential equations. *ICLR Workshop on Deep Learning for Simulation*, Virtually, May 2021.
2. DeepXDE: A deep learning library for solving differential equations. *Workshop on Mathematical Machine Learning and Application*, Pennsylvania State University, Virtually, Dec. 2020.
3. DeepXDE: A deep learning library for solving differential equations. *AAAI Spring Symposium on Combining Artificial Intelligence and Machine Learning with Physical Sciences*, Stanford, CA, Mar. 2020.
4. DeepXDE: A deep learning library for solving forward and inverse differential equations. *3rd Physics Informed Machine Learning Workshop*, Santa Fe, NM, Jan. 2020.
5. DeepXDE: A deep learning library for solving differential equations. *Conference on Neural Information Processing Systems Workshop on Machine Learning and the Physical Sciences*, Vancouver, Canada, Dec. 2019.
6. DeepXDE: A deep learning library for solving differential equations. *Deep Learning for Science School*, Berkeley, CA, July 2019.
7. Quantitative prediction of erythrocyte sickling for anti-polymerization activities in sickle cell disease. *60th Annual Red Cell Meeting*, New Haven, CT, Oct. 2018.
8. Probing the twisted structure of sickle hemoglobin fibers via particle simulations. *20th Biennial Hemoglobin Switching Conference*, Pacific Grove, CA, Sept. 2016.
9. Shock tube ignition delay time study of RP-1/oxygen/argon mixtures. *Stanford Undergraduate Visiting Research Symposium*, Stanford, CA, Aug. 2012.
10. The feasibility analysis of small-sized commercial ice-storage air-conditioning system. *10th National Symposium on Refrigerators, Air Conditioners and Compressors*, Qingdao, China, Aug. 2011.

Supervision

Ph.D. Students

1. Joel Hayford, Chemical and Biomolecular Engineering, 2022–present
2. Jonathan Lee, Chemical and Biomolecular Engineering, 2022–present
3. Langchen Liu, Applied Mathematics and Computational Science, 2022–present
4. Mitchell Daneker, Chemical and Biomolecular Engineering, 2021–present
5. Min Zhu, Chemical and Biomolecular Engineering, 2021–present

Master's Students

1. Ziyi Huang, Chemical and Biomolecular Engineering, 2022–present
2. Handi Zhang, Applied Mathematics and Computational Science, 2021–present
3. Anran Jiao, Data Science, 2021–present
4. Chenxi Wu, Chemical and Biomolecular Engineering, 2021–2022 → PhD student, Brown University
5. Shuai Meng, Data Science, 2021–2022 → PhD student, University of California, Berkeley

Undergraduate Students

1. Karan Jaisingh, Computer Science, 2022–present
2. Eric Myzelev, Mathematics, 2022–present

3. Caroline Chen, Computer Science, 2022–present
4. Boya Zeng, Computer Science & Mathematics, 2022–present

High School Students

1. Benjamin Fan, MIT's PRIMES-USA program, 2022–present
2. Edward Qiao, MIT's PRIMES-USA program, 2022–present
3. Jeremy Yu, MIT's PRIMES-USA program, 2021–2022 → Undergraduate student, Massachusetts Institute of Technology

Teaching Experience

University of Pennsylvania

- CBE 410 Chemical Engineering Laboratory — Fall 2022
- ENM 601 Data Science and Machine Learning in Chemical Engineering — Spring 2022

Massachusetts Institute of Technology

- Instructor, 18.085 Computational Science and Engineering I — Spring 2021
- Recitation Instructor, 18.02 Multivariable Calculus — Fall 2020

Brown University

- Teaching Assistant, APMA 2550 Numerical Solution of Partial Differential Equations I — Fall 2017, Fall 2018
- Teaching Assistant, APMA 1200 Operations Research: Probability Models — Spring 2018
- Teaching Assistant, APMA 1690 Computational Probability and Statistics — Fall 2017
- Teaching Assistant, ENGN 1860 Advanced Fluid Mechanics — Spring 2015

Tsinghua University

- Instructor, Tsinghua University National Students' Innovation Camp — 8/2011
- Instructor, Tsinghua University learning center — 3/2010–12/2011

Professional Services

Global Online Seminar Organizer

- Complex Fluids and Soft Matter Seminar, 2/2022–present

Conference Minisymposium Organizer

- SIAM Conference on Uncertainty Quantification – Operator Learning for Uncertainty Quantification, 2022
- SIAM Conference on Computational Science and Engineering – Machine Learning for Physical Systems, 2021
- SIAM Conference on Mathematics of Data Science – Machine Learning for Physical Systems, 2020

Grant Reviewer

- U.S. DOE SC ASCR
- Canada New Frontiers in Research Fund

Journal Reviewer

- Nature Machine Intelligence
- Nature Computational Science
- Nature Communications
- IEEE Transactions on Neural Networks and Learning Systems
- Acta Materialia
- Metabolism: Clinical and Experimental
- Computer Methods in Applied Mechanics and Engineering
- Applied Mathematics and Mechanics
- Advances in Water Resources
- Journal of Computational Physics
- Neurocomputing
- Engineering Applications of Artificial Intelligence
- Computers & Mathematics with Applications
- SIAM Journal on Scientific Computing
- Neural Networks
- Computer Physics Communications
- Journal of Scientific Computing
- Mechanics of Materials
- Computers in Biology and Medicine
- Engineering Analysis with Boundary Elements
- Physica D: Nonlinear Phenomena
- Scientific Reports
- PLoS ONE
- Communications in Computational Physics
- Applied Numerical Mathematics
- Multiscale Modeling & Simulation
- Journal of Materials Research
- Neural Computation
- European Journal of Applied Mathematics
- Communications in Mathematical Sciences
- Journal of Machine Learning

Conference Reviewer

- Conference on Neural Information Processing Systems
- International Conference on Machine Learning
- International Conference on Learning Representations
- Mathematical and Scientific Machine Learning

University Services

- Organizer, AMCS Colloquium, University of Pennsylvania, Fall 2021–present

- PhD Admissions Committee, Department of Chemical and Biomolecular Engineering, University of Pennsylvania, 2022
- PhD Admissions Committee, Graduate Group in Applied Mathematics and Computational Science, University of Pennsylvania, 2022

Services on Thesis Committees

- Sifan Wang, Graduate Group in Applied Mathematics and Computational Science, University of Pennsylvania, 2022–present
- Georgios Kissas, Department of Mechanical Engineering and Applied Mechanics, University of Pennsylvania, 2022–present
- Lilia Escobedo, Department of Chemical and Biomolecular Engineering, University of Pennsylvania, 2022–present
- Shunyuan Mao, Department of Physics and Astronomy, University of Victoria, 2021

Last updated: December 13, 2022