

# Shiying Xiong (熊诗颖)

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## Current Position

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Dartmouth College

Hanover, NH, USA

Postdoc in Computer Science, Advisor: Prof. Bo Zhu

10/2019 - Current

## Education

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Peking University

Beijing, China

Ph.D. in Fluid Mechanics, Advisor: Prof. Yue Yang

09/2014 - 07/2019

Jilin University

Changchun, China

B.S. in Physics

09/2010 - 07/2014

## Research Interests

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Vortex Dynamics, Computational Physics, Computer Graphics, and Scientific Machine Learning

## Preprints

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1. S. Xiong, X. He, S. Yang, Z. Wang, Y. Tong, R. Tao, R. Liu, and B. Zhu. RoeNets: predicting discontinuity of hyperbolic systems from continuous data. *Journal of Computational Physics* (Under review)
  2. F. Feng, S. Xiong, Z. Liu, Z. Xian, Y. Zhou, H. Kobayashi, A. Kawamoto, T. Nomura, B. Zhu. Cellular topology optimization on differentiable Voronoi diagrams. (Under review)
  3. S. Xiong, X. He, S. Yang, Y. Tong, Y. Deng, and B. Zhu. Neural vortex method: from finite Lagrangian particles to infinite-dimensional Eulerian dynamics. (In preparation)

## Publications (Corresponding author \*)

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1. S. Xiong, Z. Wang, M. Wang, and B. Zhu. A Clebsch method for free-surface vortical flow simulation. *ACM Transactions on Graphics*, 41, 116, 2022 (SIGGRAPH, **Featured on video trailer**)
  2. R. Tao, H. Ren, Y. Tong, and S. Xiong\*. Construction and evolution of knotted vortex tubes in incompressible Schrödinger flow. *Physics of Fluids*, 33, 077112, 2021 (**Editor's pick**)
  3. S. Xiong, R. Tao, Y. Zhang, F. Feng, and B. Zhu. Incompressible flow simulation on vortex segment clouds. *ACM Transactions on Graphics*, 40, 98, 2021 (SIGGRAPH, **Featured on video trailer**)
  4. S. Yang, S. Xiong\*, Y. Zhang, F. Feng, J. Liu, and B. Zhu. Clebsch gauge fluid. *ACM Transactions on Graphics*, 40, 99, 2021 (SIGGRAPH)
  5. Y. Tong, S. Xiong\*, X. He, G. Pan, and B. Zhu. Symplectic neural networks in Taylor series form for Hamiltonian systems. *Journal of Computational Physics*, 437, 110325, 2021
  6. S. Xiong\*, Y. Tong, X. He, S. Yang, C. Yang, and B. Zhu. Nonseparable symplectic neural networks. *International Conference on Learning Representations*, 2021 (ICLR)
  7. S. Xiong and Y. Yang\*. Effects of twist on the evolution of knotted magnetic flux tubes. *Journal of Fluid Mechanics*, 895, A28, 2020
  8. S. Xiong and Y. Yang\*. Identifying the tangle of twisted vortex tubes in homogeneous isotropic turbulence. *Journal of Fluid Mechanics*, 874, 952-978, 2019 (**Featured on cover**)

9. S. Xiong and Y. Yang\*. Construction of knotted vortex tubes with the writhe-dependent helicity. *Physics of Fluids*, 31, 047101, 2019 (**Editor's pick**)
10. S. Xiong and Y. Yang\*. The boundary-constraint method for constructing vortex-surface fields. *Journal of Computational Physics*, 339, 31-45, 2017
11. Y. Deng, M. Wang, X. Kong, S. Xiong, and B. Zhu. A moving Eulerian-Lagrangian particle method for thin film and foam simulation. *ACM Transactions on Graphics*, 41, 154, 2022 (SIGGRAPH)
12. S. Ruan, S. Xiong, and J. You, and Yue Yang\*. Generation of streamwise helical vortex loops via successive reconnections in early pipe transition. *Physics of Fluids*, 34, 054112, 2022
13. F. Feng, J. Liu, S. Xiong, S. Yang, Y. Zhang, and B. Zhu. Impulse fluid simulation. *IEEE Transactions on Visualization and Computer Graphics*, DOI: 10.1109/TVCG.2022.3149466
14. M. Wang, Y. Deng, X. Kong, A. Prasad, S. Xiong, and B. Zhu. Thin-film smoothed particle hydrodynamics fluid. *ACM Transactions on Graphics*, 40, 110, 2021 (SIGGRAPH, **Featured on video trailer**)
15. D. DiPietro, S. Xiong, and B. Zhu. Sparse symplectically integrated neural networks. *Advances in Neural Information Processing Systems*, 33, 2020 (NeurIPS)
16. S. Xiong and Y. Yang\*. Evolution and helicity analysis of linked vortex tubes in viscous flows. *SCIENTIA SINICA Physica, Mechanica & Astronomica*, 50, 040005, 2020 (In Chinese)
17. J. Hao, S. Xiong, and Y. Yang\*. Tracking vortex surfaces frozen in the virtual velocity in non-ideal flows. *Journal of Fluid Mechanics*, 863, 513-544, 2019
18. H. Zhou, J. You, S. Xiong, Y. Yang\*, D. Thévenin, and S. Chen. Interactions between the premixed flame front and the three-dimensional Taylor-Green vortex. *Proceedings of the Combustion Institute*, 37, 2461-2468, 2019
19. Y. Zhao, S. Xiong, Y. Yang\*, and S. Chen. Sinuous distortion of vortex surfaces in the lateral growth of turbulent spots. *Physical Review Fluids*, 3, 074701, 2018

## Conference Presentations

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1. A Clebsch method for free-surface vortical flow simulation. *Dartmouth Innovation and Technology Festival* (Poster), May 2022
  2. Incompressible fluid simulation based on vortex surface field. *212th Graphics and Mixed Environment Seminar* (Games Webinar, Virtual, **Invited Speaker**), Dec. 2021
  3. Incompressible flow simulation on vortex segment clouds. *Special Interest Group for Computer Graphics* (SIGGRAPH, Virtual), Aug. 2021
  4. Nonseparable symplectic neural networks. *9th International Conference on Learning Representations* (ICLR, Virtual), May 2021
  5. Identifying the tangle of twisted vortex tubes in homogeneous isotropic turbulence. *71st Annual Meeting of the APS Division of Fluid Dynamics*, Nov. 2018, Atlanta, USA
  6. Spiral vortex structures in homogeneous isotropic turbulence. *10th National Congress on Fluid Mechanics of China*, Oct. 2018, Hangzhou, China
  7. Identifying the spiral vortex tubes and tracking vortex surfaces frozen in the virtual velocity. *Chiral and Structure Seminar at Su-Cheng Center*, Oct. 2018, Nanjing, China
  8. Construction of vortex-surface fields in isotropic turbulence. *Chinese Congress of Theoretical and Applied Mechanics*, Aug. 2017, Beijing, China
  9. Characterization of representative vortex surfaces in K-type transitional boundary layer. *10th International Symposium on Turbulence and Shear Flow Phenomena*, Jul. 2017, Chicago, USA
  10. The boundary-constraint method for constructing vortex-surface fields. *69th Annual Meeting of the APS Division of Fluid Dynamics*, Nov. 2016, Portland, USA

11. Construction of Vortex-surface fields based on boundary constraint, *9th National Congress on Fluid Mechanics of China*, Oct. 2016, Nanjing, China

## **Mentoring** (with Prof. Bo Zhu)

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- Daniel M. DiPietro (Undergraduate at Dartmouth College)  
*2021 Neukom Undergraduate Research Prize Winner, CRA Outstanding Undergraduate Researcher Finalist*
- Yunjin Tong (Undergraduate at Dartmouth College)  
*2021 Francis L. Town Scientific Prize, 2022 CRA Outstanding Undergraduate Researcher Honorable Mention*
- Shuqi Yang (Master at Dartmouth College)  
*2021 Neukom Graduate Research Prize Winner*
- Zhecheng Wang (Visiting undergraduate at Dartmouth College)
- Rui Tao (Visiting Ph.D. Student at Dartmouth College)

## **Teaching**

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- Spring 2022, Teaching, *Differential Geometry*, Seminar Talk, Dartmouth College
- Spring 2018, 2016, Teaching Assistant, *Engineering Mathematics*, Yuanpei College, Peking University
- Spring 2017, Teaching Assistant, *Calculus II*, College of Engineering, Peking University

## **Service**

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The referee for *Journal of Computational Physics*, *Physics of Fluids*, *Fluids*, *Micromachines*, *International Conference on Learning Representations*, *International Conference on Machine Learning*, *Conference on Neural Information Processing Systems*