

# JINYUAN LIU

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## EDUCATION

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### Ph. D. Student

Jan. 2021 – present

Department of Mechanical and Aerospace Engineering, UC San Diego  
Advisor: Sutanu Sarkar

- Topic: Coherent structures, instabilities, and turbulence in stratified, rotating wakes

### B. S. E., Engineering Thermo-physics (with distinction)

Aug. 2016 – June 2020

Department of Engineering Mechanics, Tsinghua University

- Dissertation Title: Large- and very-large-scale structures in turbulent channels

### Visiting Research Student

Sep. 2019 – Mar. 2020

School of Aeronautics, Universidad Politécnica de Madrid  
Advisor: Javier Jiménez

- Topic: Lifetimes of the largest structures in turbulent channels at  $Re_\tau = 2000, 5300$ .

## AWARDS

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Academic Distinction Award for Graduates, Tsinghua University	2020
Outstanding Undergraduate Dissertation, Tsinghua University	2020
Second Prize for Student Research Training, Tsinghua University	2019
Scholarship for Scientific Innovation, Tsinghua University	2018
Scholarship for Overall Excellence, Tsinghua University	2018
Scholarship for Academic Distinction, Tsinghua University	2017, 2018, 2019
First Prize, National Aerospace Knowledge Competition for College Students	2018
Outstanding Teaching Assistant of The Year, MAE Department, UC San Diego	2024

## FELLOWSHIPS AND MEMBERSHIPS

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Fellowship, the fifth Madrid Turbulence Summer School, Universidad Politécnica de Madrid	2023
Fellowship, Spark Innovative Talent Cultivation Program, Tsinghua University	2018
Student Membership, American Physical Society, Division of Fluid Dynamics	since 2019
Student Membership, American Institute of Aeronautics and Astronautics	since 2024

## WORK EXPERIENCE

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### Graduate Research Assistant

Jan. 2021 – present

Mechanical and Aerospace Engineering, UC San Diego  
Advisor: Sutanu Sarkar

### Post-baccalaureate Research Assistant

July 2020 – Dec. 2020

Department of Engineering Mechanics, Tsinghua University  
Advisor: Wei-Xi Huang

### Research Assistant

Sep. 2019 – Mar. 2020

School of Aeronautics, Universidad Politécnica de Madrid  
Advisor: Javier Jiménez

## RESEARCH ACTIVITIES

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### Publications and preprints

4. Jinyuan Liu, Pranav Puthan, and Sutanu Sarkar. Turbulence in stratified rotating topographic wakes. *being submitted to Journal of Physical Oceanography*, 2025.  
(arXiv preprint will be updated on webpage)
3. Jinyuan Liu, Pranav Puthan, and Sutanu Sarkar. Effect of rotation on wake vortices in stratified flow. *Journal of Fluid Mechanics*, 999:A44, 2024. [doi:10.1017/jfm.2024.721](https://doi.org/10.1017/jfm.2024.721), [arXiv:2401.02089](https://arxiv.org/abs/2401.02089)
2. Jinyuan Liu and Sutanu Sarkar. Coherence analysis of geophysical wakes in flow past a three-dimensional hill. In *Journal of Physics: Conference Series (Proceeding for the fifth Madrid Turbulence Summer School)*. IOP Publishing, 2024. [doi:10.1088/1742-6596/2753/1/012007](https://doi.org/10.1088/1742-6596/2753/1/012007)
1. Chunmei Xie, Jinyuan Liu, Jing-Wei Jiang, and Wei-Xi Huang. Numerical study on wetted and cavitating tip-vortical flows around an elliptical hydrofoil: Interplay of cavitation, vortices, and turbulence. *Physics of Fluids*, 33(9):093316, 2021. [doi.org/10.1063/5.0064717](https://doi.org/10.1063/5.0064717)

### Manuscript in preparation

1. Adal Galván Castro, Jinyuan Liu, Miguel P. Encinar, and Javier Jiménez. The lifetimes of the largest scales in turbulent channels up to  $Re_\tau = 5300$ . *in preparation for J. Fluid. Mech.*
2. Lijin Jayan, Jinyuan Liu, Manikandan Mathur, and Sutanu Sarkar. Lagrangian transport in stratified wake of an underwater hill. *in preparation for JGR Oceans*.

### Ongoing work

1. Jinyuan Liu and Sutanu Sarkar. Instabilities, dislocations, transitions to three-dimensionality and to turbulence in strongly stratified wakes. Part I. Linear analysis of the vertical instability. Part II. Nonlinear evolution and the minimal flow unit.

### Talks and conference presentations

8. **Jinyuan Liu**, Pranav Puthan, and Sutanu Sarkar. Turbulence generated by an isolated topography in stratified rotating flows. The 77th Annual Meeting of APS DFD, Salt Lake City, November 2024.
7. **Jinyuan Liu** and Sutanu Sarkar. Coherent structures and their minimal flow units in strongly stratified Kármán wakes. Workshop on Coherent Structures for Turbulence Modeling, Santa Fe, November 2024.
6. **Jinyuan Liu**, Pranav Puthan, and Sutanu Sarkar. Stratified wakes past an isolated topography. The 17th SoCal Fluids Symposium, UCI, Irvine, April 2024.
5. **Jinyuan Liu**, Pranav Puthan, and Sutanu Sarkar. Stratified wakes past an isolated topography: coherent structures and vortex dynamics. Ocean Science Meeting 2024, New Orleans, February 2024.
4. **Jinyuan Liu**, Pranav Puthan, and Sutanu Sarkar. Coherent vortex structures in stratified rotating flow past a three-dimensional hill. The 76th Annual Meeting of APS DFD, Washington DC, November 2023.

3. **Jinyuan Liu**, Pranav Puthan, and Sutanu Sarkar. Influence of rotation on the vortex dynamics in stratified flow past an underwater hill. The 16th SoCal Fluids Symposium, SDSU, San Diego, April 2023.
2. **Jinyuan Liu**, Pranav Puthan, and Sutanu Sarkar. Spatiotemporal analysis of coherent structures in the wake of an underwater hill. The 75th Annual Meeting of APS DFD, Indianapolis, November 2022.
1. **Jinyuan Liu**, Pranav Puthan, and Sutanu Sarkar. Structures of vortices in underwater hill wakes. The 15th SoCal Fluids Symposium, UCLA, Los Angeles, April 2022.

## TEACHING ACTIVITIES

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<b>Teaching Assistant, UC San Diego</b>	Winters 2022, 2023, 2024
MAE290B Numerical Methods for ODEs & PDEs (graduate level)	
Instructor: Sutanu Sarkar	
<b>Teaching Assistant, UC San Diego</b>	Springs 2022, 2023
MAE214A Introduction to Turbulence and Turbulent Mixing (graduate level)	
Instructor: Sutanu Sarkar	
<b>Teaching Assistant, UC San Diego</b>	Winter 2025
MAE101B 'Advanced' Fluid Mechanics (undergraduate level)	
Instructor: Hieu Pham	

## MENTORING EXPERIENCE

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Chenyao Luo (Master of Science in Fluid Mechanics)  
 Thesis topic: Numerical simulation and modal analysis of two-dimensional wakes

## SERVICES

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Referee for: *Journal of Fluid Mechanics*, *Physics of Fluids*, *Acta Mechanica Sinica*  
 Chairperson, the 12<sup>th</sup> Spark Innovative Talent Cultivation Program, Tsinghua University  
 Peer Mentor of 15 freshmen, School of Aerospace, Tsinghua University 2018, 2019  
 JUMP Mentor of 8 freshmen, Jacob School of Engineering, UC San Diego 2020, 2021

## TECHNICAL SKILLS

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<b>Programming Languages</b>	FORTRAN, C++, MATLAB, Python, L <sup>A</sup> T <sub>E</sub> X, Bash (Unix Shell)
<b>Numerical Packages</b>	MPI, HDF5, FFTW, LAPACK, SCALAPACK, BLAS, FISHPACK
<b>Software Capability</b>	ParaView, Tecplot, Dedalus, OpenFOAM, Mathematica, OriginPro
<b>CAE Usage (rarely)</b>	AutoCAD, SOLIDWORKS, ANSYS ICEM, ANSYS Fluent

## RELEVANT COURSEWORK

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<b>Fluids</b>	Tsinghua: Fluid Mechanics, Aerodynamics, Compressible Flows, Turbulence Theory, Viscous Fluid Flows, Turbulence Modeling, Heat Transfer, Numerical Heat Transfer, CFD, Advanced CFD, Combustion Theory, Propulsion Theory UCSD: Graduate Fluid Mechanics, Geophysical Fluid Dynamics (I, III), Ocean Waves, Hydrodynamic Stability, Astrophysical Fluid Dynamics, Turbulence and Mixing
<b>Math</b>	Matrix Analysis, Asymptotic Analysis, Partial Differential Equations, Numerical Analysis, Computational Stochastics, Model Reduction
<b>Numerics</b>	Numerical Linear Algebra, Numerical Methods for ODEs and PDEs, Computational Fluid Dynamics, Parallel Computing

## EXTRA-CIRRICULAR

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Former member, the baseball team and the water polo team, Tsinghua University

Former member, the swimming team, School of Aerospace, Tsinghua University

Go (Wei-Qi) player ranked amateur 5-dan, Chinese Go Association

2013

Honorary Citizen, Tulsa, OK

2014

Published aviation photographer (selected to photography team of Airways Magazine)

Trumpet player

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Updated: February 5, 2025