BROWN

Xinyi Huang

Department of Earth, Environmental & Planetary Sciences, Brown University

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Positions

Postdoctoral Research Associate Aug. 2025 – present

Department of Earth, Environmental & Planetary Sciences

Brown University, Providence, RI Advisors: Dr. Baylor Fox-Kemper, Dr. Emanuele Di Lorenzo

Postdoctoral Scholar Research Associate Aug. 2023 – Jul. 2025

Graduate Aerospace Laboratories, Division of Engineering and Applied Science Advisor: Dr. Jane Bae

California Institute of Technology, Pasadena, CA

Education

Ph.D. in Mechanical Engineering Aug. 2018 – May 2023

Department of Mechanical Engineering, College of Engineering Advisor: Dr. Xiang Yang

The Pennsylvania State University, University Park, PA, USA

Bachelor of Engineering, Tsien Excellence in Education Program Aug. 2014 – June 2018

Department of Engineering Mechanics, School of Aerospace Engineering

Bachelor of Mathematics and Applied Math Aug. 2015 – June 2018

Department of Mathematical Sciences

Tsinghua University, Beijing, China

Journal publications

- Huang, X. (2026). How does wall modeling impact the momentum transfer of modeled wall turbulence?. In *J. Phys.: Conf. Ser.,* 3230, 012023. IOP Publishing.
- Huang, X., Leung, S. C., & Bae, H. J. (2026). Consistency requirement of data-driven subgrid-scale modeling in large-eddy simulation. *Phys. Rev. Fluids*, *11*(1), 014602.
- Huang, X., & Li, J. J. L. (2025). Characteristics of the meandering effect in a stratified wake. *Phys. Rev. Fluids*, *10*(1), 014602.
- Huang, X., Leung, S. C., Whitmore, M. P., Elnahhas, A., & Bae, H. J. (2024). Consistent data-driven subgrid-scale model development for large-eddy simulation. In *Proceedings of the Summer Program* (p. 1).
- Huang, X., Chyczewski T., Xia Z., Kunz, R. F., & Yang, X. I. A. (2023). Distilling experience into a physically interpretable recommender system for computational model selection. *Sci. Rep.,* 13, 2225

- Huang, X., Kunz, R. F., & Yang, X. I. A. (2023). Linear Logistic Regression with Weight Thresholding for Flow Regime Classification of a Stratified Wake. *Theor. Appl. Mech. Lett.*, 100414.
- Jain, N., Huang, X., Li, J. J. L., Yang, X. I. A. and Kunz, R. F. (2023). An Assessment of Second Moment Closure Modeling for Stratified Wakes Using Direct Numerical Simulations Ensembles. *J. Fluids Eng.*, 145(9).
- Jain, N., Pham, H. T., Huang, X., Sarkar, S., Yang, X., & Kunz, R. (2022). Second Moment Closure Modeling and Direct Numerical Simulation of Stratified Shear Layers. *J. Fluids Eng., 144*(4), 041102.
- Huang, X., Jain, N., Abkar, M., Kunz, R. F., & Yang, X. I. A. (2021). Determining a priori a RANS model's applicable range via global epistemic uncertainty quantification. *Comput. Fluids, 230*, 105113.
- Huang, X., & Yang, X. I. A. (2021). A Bayesian approach to the mean flow in a channel with small but arbitrarily directional system rotation. *Phys. Fluids*, *33*(1), 015103.
- Lv, Y., Huang, X., Yang, X., & Yang, X. I. (2021). Wall-model integrated computational framework for large-eddy simulations of wall-bounded flows. *Phys. Fluids, 33*(12), 125120.
- Yang, X. I. A., Hong, J., Lee, M., & Huang, X. (2021). Grid resolution requirement for resolving rare and high intensity wall-shear stress events in direct numerical simulations. *Phys. Rev. Fluids*, *6*(5), 054603.
- Kumar, S. S., Huang, X., Yang, X., & Hong, J. (2021). Three dimensional flow motions in the viscous sublayer. *Theor. Appl. Mech. Lett., 11*(2), 100239.
- Huang, X., Yang, X. I. A., & Kunz, R. F. (2019). Wall-modeled large-eddy simulations of spanwise rotating turbulent channels—Comparing a physics-based approach and a data-based approach. *Phys. Fluids*, *31*(12), 125105.
- Yang, X. I. A., Xu, H. H. A., Huang, X., & Ge, M. W. (2019). Drag forces on sparsely packed cube arrays. *J. Fluid Mech.*, *880*, 992-1019.

Experience

Postdoctoral Research Associate Fall 2025 – present

Fox-Kemper Research Group for ocean modeling and theory, Brown University, Providence, RI, USA

- Develop benchmarking dataset for emulators of OSOM (Ocean State Ocean Model), a regional ocean model for the Narragansett Bay area.
- Use machine learning techniques to downscale regional ocean models in 3CRS (New England Community-Driven Coastal Climate Research and Solutions) project.
- Contribute to a review paper on coupling of offshore wind energy.

Individual research projects

- Examined the causality and the correlation between the wall event and the wall statistics in a wall-modeled LES, 2024-2025
- Characterized and developed the theory of the superposition for the meandering behavior of a stratified wake using large ensembles of DNS (Direct Numerical Simulation) dataset, 2022-2024

Postdoctoral Scholar Research Associate Fall 2023 – Summer 2025

Bae Research Group for computational turbulence, California Institute of Technology, Pasadena, CA, USA

- Analyzed the consistency between the *a priori* test and the *a posteriori* application of data-driven subgrid scale (SGS) model.
- Examined the impact of filtering on modeling in the LES (Large-Eddy Simulation).
- Developed an aligned model between the *a priori* test and the *a posteriori* tests with the application to homogeneous isotropic turbulence with a data-driven approach.

Graduate Research Assistant Fall 2018 – Spring 2023

Flow Physics and Computational Research Lab, The Pennsylvania State University, University Park, PA, USA

- Focused on the combination of data-driven approach and turbulence research.
  Multiple techniques are used for understanding the physics and for modeling, including the neural network, Bayesian optimization, logistic regression, and recommender system.
- Simulated canonical flows under different scenarios, including flows with rotation, with stratification and with adverse pressure gradient, using both in-house codes, e.g., LESGO, CharLES, AFiD, NPHASE-PSU and commercial software, e.g., STAR-CCM+.
- Developed and modified in-house CFD codes under high performance computing/message passing interface environment (HPC/MPI) in C/C++ and FORTRAN.
- Designed and generated computational grid (mesh) according to the simulation requirements, including DNS grid, WMLES grid, WRLES grid and RANS grid.
- Explored routes of applying data-driven tools to improving turbulence modeling, from evaluation of the physics and exploration of the parameter space to model augmentation and model selection.

Future Faculty Immersive Teaching Program Fall 2021 – Spring 2022

(EDSGN100 **instructor of record**)

School of Engineering Design, Technology, and Professional Programs, The Pennsylvania State University

- Served as the instructor of record for 3 sections of 3-credit class EDSGN100 (Cornerstone Engineering Design) on engineering design tools.
- Closely worked with the teaching team, including other instructors and my TAs, on collaborative course development when building the course from scratch.

Graduate Teaching Assistant Fall 2018 & Fall 2019 (ME300), Fall 2020 (ME201)

Department of Mechanical Engineering, The Pennsylvania State University, University Park, PA, USA

- Graded homework and exams for ME300 (Thermodynamics) and ME201 (Introduction to thermal science);
- Provided review lectures and held regular office hours.

Visiting student, Department of Mechanical Engineering, The University of Melbourne

Nov. 2017 – Feb. 2018

Undergraduate Visiting Researcher (UGVR) program,

Department of Mechanical Engineering, Stanford University June 2017 – Sep. 2017

Awards & Fellowships

Sixth Madrid Turbulence Workshop, Universidad Politécnica de Madrid Summer 2025

Proposal title: How does wall modeling impact the ergodicity of modeled wall turbulence?

Center for Turbulence Research 20th Biennial Summer Program Summer, Stanford University Summer 2024

Proposal title: Consistent subgrid-scale model and wall model with data-driven techniques

Future Leaders in Aerospace Symposium 2024

Undergraduate Visiting Researcher (UGVR) program, Stanford University Summer 2017

Skills

- **Programming languages**: MATLAB, FORTRAN, C/C++, Python, LaTeX; git
- **Software**: (Proficient) STAR-CCM+, Pointwise, Tecplot; (Acquainted) OpenFOAM, Solidworks
- **Experimental Technique**: (Acquainted) Hot wire technique, Particle image velocimetry (PIV)

Professional services

Journal referee for

- *Journal of Fluid Mechanics*
- *Journal of Turbulence*
- *Journal of Fluids Engineering*
- *JFM Rapids*
- *Entropy*
- *Science Advances*
- *Advances in Aerodynamics*

Conference presentations

- Huang, X., (2025). How does wall modeling impact the momentum transfer of the modeled wall turbulence? *Bulletin of the American Physical Society*.
- Huang, X., Leung, S. C., & Bae, J. (2024). Numerical error of explicitly filtered large-eddy simulation for consistent data-driven modeling. *Bulletin of the American Physical Society*.
- Leung, S. C., Huang, X., & Bae, J. (2024). Consistent Subgrid-scale Model Development for Large-eddy Simulation with Data-driven Sparse Identification. *Bulletin of the American Physical Society*.
- Huang, X., Li, J., & Yang, X. (2023). The characteristics of the meandering effect in a stratified wake. *Bulletin of the American Physical Society*.
- Huang, X., Kunz, R., & Yang, X. (2022). Linear logistic regression with weight thresholding for flow regime classification of a stratified wake. *Bulletin of the American Physical Society*.
- Huang, X., & Yang, X. (2022). The characteristics of the meandering effect in a stratified wake. In *AGU Fall Meeting Abstracts* (Vol. 2022, pp. NG15A-04).

- Jain, N., Li, J., Huang, X., Yang, X. F., & Kunz, R. (2022). On the Modeling of Dissipation Anisotropy, Pressure Diffusion and Coherent Structures in Stratified Wakes Using Second Moment Closure. *Bulletin of the American Physical Society*.
- Huang, X., Kunz, R., & Yang, X. (2021). Data-driven computational model selection via recommender systems. *Bulletin of the American Physical Society, 66*.
- Jain, N., Huang, X., Yang, X., & Kunz, R. (2021). Insights into second-moment closure modelling performance for stratified wakes from DNS ensembles. *Bulletin of the American Physical Society*, *66*.
- Huang, X., Jain, N., Kunz, R., & Yang, X. (2020). Epistemic uncertainty quantification of Reynolds stress models. *Bulletin of the American Physical Society*.
- Yang, X., Huang, X., & Abkar, M. (2020). A Bayesian approach to flow in a channel with small but arbitrarily directional system rotation. *Bulletin of the American Physical Society*, *65*.
- Jain, N., Huang, X., Pham, H., Yang, X., Sarkar, S., & Kunz, R. (2020). Reynolds Stress/Flux/Variance Modeling and DNS of Stratified Shear Layers. *Bulletin of the American Physical Society*, *65*.
- Sankar, S. K., Huang, X., Yang, X., & Hong, J. (2020). Structures in the viscous sublayer and the prediction of wall shear stress. In *APS Division of Fluid Dynamics Meeting Abstracts* (pp. E08-003).
- Huang, X., & Yang, X. (2019). Wall-modeled LES of flow around a prolate spheroid at various angles of attack. *Bulletin of the American Physical Society*, *64*.
- Yang, X., & Huang, X. (2019). Comparing a data-based approach and a physics-based approach for wall modeled LES of flow in a spanwise rotating channel. *Bulletin of the American Physical Society*, *64*.