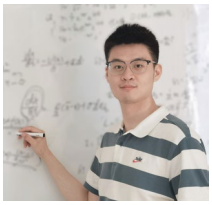
CURRICULUM VITAE

JIASHUN GUAN 关家顺



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ResearchGate
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EDUCATION

Peking University, College of Engineering, Beijing, China. 09/2020-06/2025
Ph.D., Fluid Mechanics

- Supervised by Prof. Jianjun Tao, Director of Fluid Dynamics Division.

Tianjin University, School of Civil Engineering, Tianjin, China. 09/2016-06/2020
B.Eng., Ocean Engineering

Massachusetts Institute of Technology, Cambridge, USA. 01/2020-06/2020
Visiting Student, Ocean Engineering, Department of Mechanical Engineering

- Supervised by Dr. Yuming Liu in the Vortical Flow Research Laboratory (VFRL).

RESEARCH INTERESTS

My primary research is dedicated to **the laminar-turbulent transition,** and explore the underlying physical mechanism with dynamic system approach, brute-force DNS, experimental data, and machine learning tools.

CURRENT RESEARCH

Project: Subcritical Transition in Wall-bounded Shear Flow 04/2022 - present
Supervisor: Prof. Jianjun Tao, Director of Fluid Dynamics Division, Peking University.

- **Pipe Flow:** The onset of turbulence in pipe flow has posed a fundamental challenge since Reynolds' seminal work in 1883. By integrating brute-force DNS, theoretical analysis, and verifications with experimental data, we identify distinct regimes of puff relaminarization separated by a critical Reynolds number, which is defined by a noisy saddle-node bifurcation derived from the N-S equations. These findings establish **a first-principles** theoretical framework for the enigmatic dynamics of puffs, resolving the long-standing question of turbulence origin in pipe flow. (The onset of metastable turbulence in pipe flow. *Arxiv*, 2025).

- **Square Duct Flow:** The spatio-temporal dynamics of localized turbulent puffs in square duct flows are investigated through DNS and theoretical analyses, revealing that puffs in square duct flows are still transient structures, which exhibit distinct lifetime scaling laws and dynamic behaviors. (Distinct lifetime scaling laws of turbulent puff in duct flow. *Physics of Fluids*, 2025).

- **Unity of Polygonal Duct Flows:** The dynamic unity of localized turbulence in polygonal duct

flows are investigated through DNS, theoretical analyses, and validated by previous experimental results. The effective laminar-turbulent front speeds are found collapsed in the effective Reynolds number for different polygonal duct flows, and more dynamic indices of turbulent structures are under investigating. (Propagation unity of turbulent fronts in polygonal duct flows, *ICTAM*, 2024, Paper in preparing).

Project: Vortex-induced Drag Forecast for Cylinder Flows 12/2024 - present

Supervising undergraduate students H. Hu & T. Hao (Peking Univ.), and collaborating with Dr. Y. Ren (Peking Univ.) & Prof. D. Fan (Westlake Univ.).

- **Non-uniform Inflow:** A physics-based data-driven strategy is developed to predict vortex-induced drag on a circular cylinder under non-uniform inflow conditions. (Vortex-induced drag forecast for cylinder in non-uniform inflow. *Physics of Fluids*, 2025).
- **Scaling Laws for Prediction Performance:** As the predictive time interval increases, the performance decreases following certain scaling laws. The underlying mechanism is currently investigated using the dynamic system approach and brute-force DNS. (Paper in preparing).

RESEARCH EXPERIENCE

Project: Modeling of Aquaculture Cage System in Offshore Water 01/2020-06/2020

Supervisor: Dr. Yuming Liu, Senior Research Scientist, MIT.

- Funded by Outstanding Undergraduate Overseas Graduate Thesis Program to finish my undergraduate thesis at MIT.
- The research project used CFD and experiment tools to analyze hydrodynamic modeling of aquaculture cage system in offshore water. The objective of this project was to offer a general guidance for aquaculture structure building.

PUBLICATIONS

Journal Publications:

- **J. Guan**, J. Tao. The onset of metastable turbulence in pipe flow. *Arxiv*, 2025, https://arxiv.org/abs/2504.14465
- **J. Guan**, J. Tao. Distinct lifetime scaling laws of turbulent puff in duct flow. *Physics of Fluids* (Accepted), 2025, https://arxiv.org/abs/2507.01583
- **J. Guan**, H. Hu, T. Hao, H. Wang, Y. Ren, D. Fan. Vortex-induced drag forecast for cylinder in non-uniform inflow. *Physics of Fluids* 37, 071708 (2025).

Conference Publications:

- **J. Guan**, J. Tao. Propagation unity of turbulent fronts in polygonal duct flows, *International Congress of Theoretical and Applied Mechanics* (*ICTAM*), Daegu, Korea, 2024.
- **J. Guan**, *et al.* A Study of Fish Undulatory Swimming Based on Merged CFD and Experimental Video of the Swimming Movement of Mosquito Fish. in *OCEANS 2021: San Diego-Porto* 1-6 (IEEE, 2021).
- Y. Ren, Z. Duan, **J. Guan**, W. Liu, Y. Lin. Optimal DoS attacks on remote state estimation with

continuous action spaces, *IEEE International Conference on Unmanned Systems* (*ICUS*), Nanjing, China, 2024. (Best Paper Award).

ACADEMIC SERVICE

- Co-founder of Intelligent and Bio-inspired Mechanics Seminar (IBiM). 2020 – present

INVITED TALKS

- Spatio-temporal Behaviors of Turbulent Puff and the Underlying Dynamic Mechanisms, Westlake University, Hangzhou, China, Invited by Prof. Dixia Fan. 06/2025

HONORS & AWARDS

- The Third-prize Scholarship, Peking Univ. 2022, 2021
- Excellent Scientific Research Prize, Peking Univ. 2021
- **Top Ten Outstanding Youth of School of Civil Engineering** (0.28%), Tianjin Univ. 2019
- **National Endeavor Scholarship**, Ministry of Education of China 2018
- First Prize, Ship Race Competition of Tianjin Univ. 2019
- Best Design Prize, Ship Race Competition of Tianjin Univ. 2019