
Associate Professor (Tenure Track)
Department of Civil Engineering
School of Naval Architecture, Ocean and Civil Engineering
Shanghai Jiao Tong University, Shanghai, 200240

E-mail: kai.zhang@sjtu.edu.cn

Personal Website: <https://zhang-kai.xyz>

Google Scholar: <https://scholar.google.com/citations?user=xQ9TdtgAAAAJ&hl=en>

Research Interests

- Bluff Body Aerodynamics
- Computational Fluid Dynamics
- Flow Control
- Reduced-Order Modeling
- Data-Driven Analysis
- Linear Stability Analysis

Education

Yokohama National University, Yokohama, Japan

- Doctor of Engineering, Oct. 2014 – Sept. 2017.
- Master of Engineering, Oct. 2012 – Sept. 2014.
Department of Civil Engineering, Graduate School of Urban Innovation

Shanghai Jiao Tong University, Shanghai, China

- Master Candidate, Sept. 2011 – Sept. 2012.
Department of Civil Engineering, School of Naval Architecture, Ocean and Civil Engineering

Xi'an Jiao Tong University, Xi'an, China

- Bachelor of Engineering, Sept. 2007 – Aug. 2011.
Department of Civil Engineering, School of Human Settlement and Civil Engineering

Appointments

Shanghai Jiao Tong University, Shanghai, China

- Associate Professor, Feb. 2022 – present
School of Naval Architecture, Ocean and Civil Engineering

Rutgers University, New Brunswick, NJ, USA

- Postdoctoral research associate, Mar. 2020 – Jan. 2022
Department of Mechanical and Aerospace Engineering

University of California, Los Angeles, CA, USA

- Postdoctoral research associate, Jan. 2019 – Feb. 2020
Department of Mechanical and Aerospace Engineering

Florida State University, Tallahassee, FL, USA

- Postdoctoral research associate, Nov. 2017 – Dec. 2018
Department of Aerospace and Mechanical Engineering

Academic Services

Reviewer of Journal Articles

- Journal of Fluid Mechanics
- AIAA Journal
- European Journal of Mechanics - B/Fluids
- Theoretical and Computational Fluid Dynamics
- Physics of Fluids
- Journal of Nuclear Science and Technology
- Journal of Fluids Engineering

Publications

Journal Articles (* Corresponding author)

In Review

32. Tu, Y., **Zhang, K.***, Han, Z., Zhou, D. & Bilgen, O. (2022) Aerodynamic characterization of two tandem wind turbines under yaw misalignment control using actuator line model. Submitted.
31. **Zhang, K.**, Bao, Y., Zhou, D. & Han, Z. (2022) End boundary effects on wakes dynamics of inclined circular cylinders. Submitted.
30. **Zhang, K.**, Zhu, H., Cao, Y. & Zhou, D. (2022) Reynolds number effects on the bistable flows over a wavy circular cylinder. Submitted.

2022

29. Ping, H., Cao, Y., **Zhang, K.**, Han, Z., Zhou, D., Zhu, H. & Bao, Y. (2022) Vortex-induced vibrations of two rigidly coupled circular cylinders in tandem arrangement. *Ocean Engineering*, 263, 112316.
28. Marques Ribeiro, J. H., Yeh, C.-A., **Zhang, K.** & Taira, K. (2022) Wing sweep effect on laminar separated flows. *Journal of Fluid Mechanics*, 950, A23.
27. **Zhang, K.*** & Haque, N. (2022) Wake interactions between two side-by-side circular cylinders of uneven size. *Physical Review Fluids*, 7, 064703.
26. Burtsev, A., He, W., Hayostek, S., **Zhang, K.**, Theofilis, V., Taira, K. & Amitay, M. (2022) Linear modal instabilities around post-stall swept finite aspect ratio wings at low Reynolds numbers. *Journal of Fluid Mechanics*, 944, A6.
25. **Zhang, K.***, Taira, K. (2022) Laminar vortex dynamics around forward-swept wings. *Physical Review Fluids*, 7, 024704.
24. **Zhang, K.***, Shah, B. and Bilgen, O. (2022) Low-Reynolds-number aerodynamic characteristics of airfoils with piezocomposite trailing control surfaces. *AIAA Journal*, 60(4), 2701-2706.
23. Kuang, L., Su, J., Chen, Y., Han, Z., Zhou, D., **Zhang, K.**, Zhao, Y. & Bao, Y. (2021). Wind-capture-accelerate device for performance improvement of vertical-axis wind turbines: External diffuser system. *Energy*, 239(B), 15, 122196.

2021

22. Morimoto, M., Fukami, K., **Zhang, K.** & Fukagata, K. (2021). Toward practical uses of neural networks for fluid flow estimation. *Neural Computing and Applications*, 34(5), 3647-3669.
21. Ping, H., Zhu, H., **Zhang, K.**, Zhou, D., Bao, Y. & Han, Z. (2021). Vortex-induced vibrations of two rigidly coupled circular cylinders of unequal diameters at low Reynolds number. *Physics of Fluids*, 33, 103603.
20. Fukami, K., Murata, T., **Zhang, K.** & Fukagata, K. (2021). Sparse identification of nonlinear dynamics with low-dimensionalized flow representations. *Journal of Fluid Mechanics*, 926, A10.
19. Morimoto, M., Fukami, K., **Zhang, K.**, Nair, A. G. & Fukagata, K. (2021). Convolutional neural networks for fluid flow analysis: toward effective metamodeling and low-dimensionalization. *Theoretical and Computational Fluid Dynamics*, 35, 633-658.
18. Ping, H., Zhu, H., **Zhang, K.**, Zhou, D., Bao, Y., Xu, Y. & Han, Z. (2021). Dynamic mode decomposition based analysis of flow past a transversely oscillating cylinder. *Physics of Fluids*, 33, 033604.
17. Zhang, Z., Tu, J., **Zhang, K.**, Yang, H., Han, Z., Zhou, D., Xu, J. & Zhang, M. (2021). Vortex characteristics and flow-induced forces of the wavy cylinder at a subcritical Reynolds number. *Ocean Engineering*, 222, 108593.

16. Chen, Y., Dong, Z., Wang, Y., Su, J., Zhou, D., **Zhang, K.**, Zhao, Y., Bao, Y. & Han, Z. (2021). Short-term wind speed predicting framework based on EEMD-GA-LSTM method under large scaled wind history. *Energy Conversion and Management*, 227, 113559.

2020

15. Ping, H., Zhu, H., **Zhang, K.**, Wang, R., Zhou, D., Bao, Y. & Han, Z. (2020). Wake dynamics behind a rotary oscillating cylinder analyzed with proper orthogonal decomposition. *Ocean Engineering*, 218, 108185.
14. **Zhang, K.**^{*}, Hayostek, S., Amitay, M., Burtsev, A., Theofilis, V. & Taira, K. (2020). Laminar separated flows over finite-aspect-ratio swept wings. *Journal of Fluid Mechanics*, 905, R1.
13. **Zhang, K.**, Zhou, D., Katsuchi, H., Yamada, H., Han, Z. & Bao, Y. (2020). Bistable states in the wake of a wavy cylinder. *Physics of Fluids*, 32(7), 074112.
12. **Zhang, K.**^{*}, Hayostek, S., Amitay, M., He, W., Theofilis, V. & Taira, K. (2020). On the formation of three-dimensional separated flows over wings under tip effects. *Journal of Fluid Mechanics*, 895, A9.

2018

11. **Zhang, K.**, Katsuchi, H., Zhou, D., Yamada, H., Bao, Y., Han, Z. & Zhu, H. (2018). Numerical study of flow past a transversely oscillating wavy cylinder at $Re = 5000$. *Ocean Engineering*, 169, 539-550.
10. **Zhang, K.**, Katsuchi, H., Zhou, D., Yamada, H. & Lu, J. (2018). Large eddy simulation of flow over inclined wavy cylinders. *Journal of Fluids and Structures*, 80, 179-198.
9. Ma, N., Lei, H., Han, Z., Zhou, D., Bao, Y., **Zhang, K.**, Zhou, L. & Chen, C. (2018). Airfoil optimization to improve power performance of a high-solidity vertical axis wind turbine at a moderate tip speed ratio. *Energy*, 150, 236-252.
8. He, T., Zhang, H. & **Zhang, K.** (2018). A smoothed finite element approach for computational fluid dynamics: applications to incompressible flows and fluid-structure interaction. *Computational Mechanics*, 62(5), 1037-1057.

2017

7. Ma, J., Zhou, D., Han, Z., **Zhang, K.**, Nguyen, J., Lu, J. & Bao, Y. (2017). Numerical simulation of fluctuating wind effects on an offshore deck structure. *Shock and Vibration*, 2017.
6. He, T., **Zhang, K.** & Wang, T. (2017). AC-CBS-based partitioned semi-implicit coupling algorithm for fluid-structure interaction using stabilized second-order pressure scheme. *Communications in Computational Physics*, 21(5), 1449-1474.
5. **Zhang, K.**, Katsuchi, H., Zhou, D., Yamada, H., Zhang, T. & Han, Z. (2017). Numerical simulation of vortex induced vibrations of a flexibly mounted wavy cylinder at subcritical Reynolds number. *Ocean Engineering*, 133, 170-181.
4. He, T. & **Zhang, K.** (2017). An overview of the combined interface boundary condition method for fluid-structure interaction. *Archives of Computational Methods in Engineering*, 24(4), 891-934.

Before 2016

3. **Zhang, K.**, Katsuchi, H., Zhou, D., Yamada, H. & Han, Z. (2016). Numerical study on the effect of shape modification to the flow around circular cylinders. *Journal of Wind Engineering and Industrial Aerodynamics*, 152, 23-40.
2. He, T. & **Zhang, K.** (2015). Combined interface boundary condition method for fluid-structure interaction: Some improvements and extensions. *Ocean Engineering*, 109, 243-255.
1. Tu, J., Zhou, D., Bao, Y., Fang, C., **Zhang, K.**, Li, C., & Han, Z. (2014). Flow-induced vibration on a circular cylinder in planar shear flow. *Computers and Fluids*, 105, 138-154.

Conference Papers

14. **Zhang, K.** and Taira, K. Aerodynamic characterization of low-aspect-ratio swept wings at $Re = 400$. *AIAA SciTech*. San Diego, CA. Jan. 3-7, 2022.
13. Morimoto, M., Fukami, K., **Zhang, K.** and K. Fukagata. Toward practical machine learning and fluid flow regressions: perspective on interpretability and generalizability. *JSFM 34th Symposium of Computational Fluid Dynamics*. Okinawa, Japan. Dec. 2020.
12. **Zhang, K.** and Bilgen, O. Multi-fidelity aerodynamic modeling of a floating offshore wind turbine rotor. *International Mechanical Engineering Congress & Exposition*. Online. Nov. 2020.

11. Hayostek, S., Amitay, M., **Zhang, K.**, Taira, K., He, W. and Theofilis, V. Wake dynamics of finite aspect ratio wings. Part I: An experimental study. *AIAA SciTech*. San Diego, CA. Jan. 7-11, 2019.
10. **Zhang, K.**, Taira, K., Hayostek, S., Amitay, M., He, W. and Theofilis, V. Wake dynamics of finite aspect ratio wings. Part II: Computational study. *AIAA SciTech*. San Diego, CA. Jan. 7-11, 2019.
9. He, W., Burtsev, A., Theofilis, V. **Zhang, K.**, Taira, K., Hayostek, S. and Amitay, M. Wake dynamics of finite aspect ratio wings. Part III: TriGlobal linear stability study. *AIAA SciTech*. San Diego, CA. Jan. 7-11, 2019.
8. Hayostek, S., Amitay, M., **Zhang, K.**, Taira, K., He, W., Burtsev, A. and Theofilis, V. Collaborative investigation of 3-D separation on low aspect ratio finite span wings. *59th Israel Annual Conference on Aerospace Sciences*. Tel Aviv and Haifa, Israel. March 2019.
7. Taira, K., **Zhang, K.**, Amitay, M., Hayostek, S., Theofilis, V., He, W. and Burtsev, A. Separated flows over finite-aspect-ratio wings: computational, experimental, and stability analyses. *11th International Symposium on Turbulence and Shear Flow Phenomenon*. Southampton, UK. Jul. 2019.
6. **Zhang, K.**, Zhou, D., Katsuchi, H., Yamada, H., Bao, Y. and Han, Z. Free and forced vibration of a wavy cylinder in cross-flow direction. *7th Conference on Bluff Body Wakes and Vortex-Induced Vibrations*. Marseille, France. Jul. 2018.
5. **Zhang, K.**, Katsuchi, H., Yamada, H. and Zhou, D. On the fluid dynamics of circular cylinders with spanwise waviness. *the 7th European-African Conference on Wind Engineering*. Liege, Belgium. Jul. 2017.
4. **Zhang, K.**, Zhou, D., Katsuchi, H., and Yamada, H. Numerical study of flow around circular cylinders with shape modification. *14th International Symposium on Structural Engineering*. Beijing, China. Oct. 2016.
3. **Zhang, K.**, Zhou, D., Katsuchi, H., and Yamada, H. Numerical investigation of vortex induced vibration of wavy cylinders. *IASS Annual Symposium*. Tokyo, Japn. Sep. 2016.
2. **Zhang, K.**, Katsuchi, H., Zhou, D. & Yamada, H. Numerical investigation of vortex induced vibration of wavy cylinders. *8th International Colloquium on Bluff Body Aerodynamics and Applications*. Boston, Massachusetts, USA. Jun. 2016.
1. **Zhang, K.**, Katsuchi, H., Zhou, D., Yamada, H. & Han, Z. Large eddy simulation of flow around circular cylinders with shape modification. *14th International Conference on Wind Engineering*, Porto Alegre, Brazil. Jun. 2015.

Presentations

3. **Zhang, K.** and Taira, K. Effect of sweep on the laminar separated flows over finite-aspect-ratio wings. *APS Division of Fluid Dynamics Meeting*, Seattle, WA. Nov. 2019.
2. **Zhang, K.** and Taira, K. Three-dimensional flow over finite-aspect-ratio wings. *13th Southern California Flow Physics Symposium*, Santa Barbara, CA. Apr. 2019.
1. **Zhang, K.** and Taira, K. Tip effects on three-dimensional wake dynamics over high-incidence finite-aspect-ratio wings. *APS Division of Fluid Dynamics Meeting*, Atlanta, GA. Nov. 2018.

Advising

Current Ph.D. students

- TU, Yu 【涂瑜】 (with Prof. D. Zhou and Prof. Z.-L. Han), 2021 – present

Current Master students

- WANG, Zhen-Fan 【王振凡】 (with Prof. D. Zhou), 2022 – present

Current Undergraduate students

- LIU, Yang-Ming 【刘扬明】, 2022 – present
- SHAO, Yo-Xiao 【邵逸骁】 (with Prof. D. Zhou), 2022 – present

Master thesis Committee (*: chair, †: work defended)

- 2023, ZHAN, Ling-Yu 【占玲玉】, Civil Engineering, Shanghai Jiao Tong University, “*Support structure optimization of large-scale offshore horizontal axis wind turbine based on multi-objective particle swarm optimization*” (Advisor: Prof. Dai Zhou)
- 2023, GONG, Ling-Yun 【龚凌云】, Civil Engineering, Shanghai Jiao Tong University, “*Study on the Efficient Tidal Energy Harvesting Mechanism of Semi-active Flapping Foil Structure Groups*”. (Advisor: Prof. Yan Bao)
- 2023, LIU, Da-lin 【刘达琳】, Civil Engineering, Shanghai Jiao Tong University, “*The Refined Simulation of Typhoon Wind Field based on WRF Model*”. (Advisor: Prof. Yong Cao)